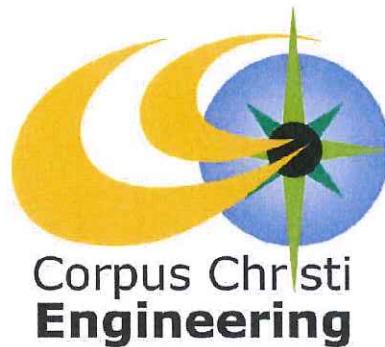


DRAFT ENGINEERING LETTER REPORT

**COUNTY ROAD 52 EXTENSION
From County Road 69 to FM 1889
(BOND ISSUE 2012 – CITY PROJECT NO. E12136)**

SUBMITTED TO:

**CITY OF CORPUS CHRISTI, TEXAS
DEPARTMENT OF ENGINEERING SERVICES**



SUBMITTED BY:



TBPE FIRM REGISTRATION NO. F-000355

**Telephone: (361) 814-9900
Fax: (361) 814-4401**

June 7, 2013

This document is released temporarily for interim review purposes only by Arturo Acuna Jr., P.E. 101906 on June 7, 2013, and shall not be used for construction, bidding, or permit purposes.

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Executive Summary

On March 26, 2013 the City of Corpus Christi City Council executed a contract for Engineering Services with Naismith Engineering, Inc. ("NEI") for County Road 52 Extension from County Road 69 to FM1889 (Bond Issue 2012, City Project No. E12136) – "The Project". The Project is approximately 4500 feet in length and includes the following estimated new material quantities: 11,600 SY pavement, 800 LF of local underground stormwater collection system composed of RCP pipe, 8900 CY of swale excavation, and a structure required for the irrigation canal crossing. There is an additional 9,600 SY in pavement, 90 LF of local underground stormwater collection, and 1400 CY of swale excavation in the section of roadway constructed by the Nueces Electric Cooperative (eastern portion of the project).

Although the current Urban Transportation Plan lists this roadway as an A-2 Arterial Divided, the Project includes the construction of a new rural roadway section matching the existing roadway segment between County Road 69 and US 77. Both intersections at each end of this section of County Road 52 will be controlled by stop signs with solar powered flashers. The pavement for the new roadway will be either hot-mix asphalt concrete (HMAC) or concrete, at the City's discretion.

The City is in the process of acquiring right-of-way for the extension of County Road 52. A 100 foot wide right-of-way section is proposed for the entire length of the roadway. The existing land is undeveloped, and consists primarily of farmland.

Stormwater improvements shall consist of typical roadside ditches; constructed to meet capacities for the service area (5 Year Frequency Storm Event). Upon completion, the project has to be completely vegetated to meet MS4 and TCEQ requirements, so alternate methods to vegetate shall be explored. Off-site drainage should be limited due to maintenance issues south and east of the project limits.

The existing water distribution system is operated by the Nueces County Water Control and Improvement District No. 3. A new 12" PVC waterline has been extended along the eastern side of the project area (from County Road 69 to the Valley View Subdivision); and an additional casing may be needed at the canal crossing for future expansion to FM 1889. Midway through the western side of the project area is an existing elevated canal that will also require crossing.

Currently there are no wastewater or gas lines in the vicinity of the project area. A corridor will be provided for the future installation of these utilities.

Following completion of the design phase and prior to advertisement for bids, all engineering data and documentation necessary for obtaining governmental permits shall be furnished to the City (Construction Stormwater Permit and TxDOT).

The preliminary estimated construction costs for The Project are shown in the Opinion of Probable Cost attached in *Appendix F*.

I. Introduction

On March 26, 2013 the City of Corpus Christi City Council executed a contract for Engineering Services with Naismith Engineering, Inc. ("NEI") for County Road 52 Extension from County Road 69 to FM1889 (Bond Issue 2012, City Project No. E12136) – "The Project". The Project includes the construction of a new rural roadway section, matching the existing roadway section between County Road 69 and US 77. This section will consist of a 100 foot right of way, 38 foot paved section, and roadside ditches. The Project is approximately 4500 feet in length and includes the following estimated new material quantities: 11,600 SY pavement, 800 LF of local underground stormwater collection system composed of RCP pipe, 8900 CY of swale excavation, and a structure required for the irrigation canal crossing.

II. Street Improvements

As previously mentioned the existing land is undeveloped and consists primarily of farmland. The recommendation is to construct a new rural roadway section matching the existing roadway segment between County Road 69 and US 77; composed of two (2) 11' wide lanes in each direction with 8' wide shoulders. The layout shall have a constant pavement width of 38'. At the intersections of County Road 69 and FM 1889 a left turn lane only and a right turn with through lane will be provided. The typical radius at each intersection should be 50', and rumble strips will be provided at each approach. Reference the **Proposed Street Improvements** exhibit contained in *Appendix E*.

Coordination will be required between the previous Maverick Engineering plans (Nueces Electric Cooperative Private Driveway and County Road 52 from CR 69 to US 77); and the County Road 52 Extension project regarding final striping of the pavement section. The Maverick Engineering plans for the NEC Private Driveway calls for 12' travel lanes with 7' shoulders; and their County Road 52 section between CR 69 to US 77 calls for 11' travel lanes with a 14' continuous left turn lane.

The speed limit for the designed roadway needs to be established in order to adequately lay out turning radius and vertical/horizontal curves. The current City Speed Limit default is 30 MPH, the County default is 45 MPH, and study recommendations completed by Traffic Engineering are 55 MPH. The Maverick Engineering plans for the NEC Private Driveway and their County Road 52 section between CR 69 to US 77 calls for a speed limit of 30 MPH. This needs to be discussed and agreed upon between the City and County.

All permanent signs will have triangular slip bases as manufactured by Trinity Highway Projects (Poz-Loc) or equal.

PROPOSED PAVEMENT IMPROVEMENTS

Kleinfelder is in the process of preparing a geotechnical report containing information on the existing soils and pavement recommendations. They will conduct five (4) pavement/soil borings in the undeveloped section of County Road 52; and three (3) borings

in the section completed by Nueces Electric Cooperative. All borings will be taken to a depth of 5', with the exception of the two (2) borings near the irrigation canal which will be taken to a depth of 40'. Kleinfelder's report will analyze five (5) pavement options. The pavement design directives on this Project were to design a pavement section with a 30-year life cycle. Based on the multiple sections provided by Kleinfelder, Naismith Engineering will recommend the final pavement sections for the proposed road extension and identify any required upgrades to the sections completed by Maverick Engineering.

For estimating purposes the following asphalt pavement section was used:

- 4" Type D HMAC
- Prime Coat, MC-30
- Seal Coat
- 10" Crushed Limestone Base (Type A, Grade 1)
- Geogrid (Tensar TX-5)
- 12" Compacted Subgrade

It should be noted that the Maverick Engineering plans for the section between CR 69 to US 77 is 2" Type D HMAC, Prime Coat, 8" Crushed Limestone Base, Geogrid, with 12" Compacted Subgrade; and for the NEC Private Driveway the section is 4" Type D HMAC, Prime Coat, 8" Crushed Limestone Base, Geogrid, with 12" Compacted Subgrade.

OPINION OF PROBABLE COST

The Opinion of Probable Cost (OPC) contained in *Appendix F* was prepared using recent average bid values taken from the *Williams Drive Phases 1 & 2 Project* (City Project Nos. 6466 & 6467). The OPC shows the Total Project Cost to be \$2,817,420.00.

III. Drainage Improvements

The County Road 52 extension from County Road 69 to FM 1889 drainage consists primarily of surface drainage that can be divided into two basins. One basin outfalls at FM 1889, while the second basin drains the area west of the irrigation canal through a crossing structure in the canal, then into an existing drainage ditch north of CR 52 draining east to County Road 69. As part of this Project, a hydraulic analysis has been performed utilizing StormCadd to verify the capacity of the existing drainage canal structure, existing drainage ditch, and existing box culvert at County Road 69 to convey the stormwater runoff from a 5-year frequency storm event. Recommendations have been provided for improvements to the existing drainage ditch as well as additional roadside ditches to convey runoff to the appropriate outfall location. Reference the **Drainage Evaluation Report** contained in *Appendix C*.

IV. Water Improvements

The existing water distribution system is operated by the Nueces County Water Control and Improvement District No. 3. A new 12" PVC waterline has been extended along the eastern side of the project area (from County Road 69 to the Valley View Subdivision) as part of the Nueces Electric Cooperative project. Midway through the western side of the project area is an existing elevated canal that will require crossing. A detail was provided that is typically used when crossing Nueces County WCID No.3 canals; but this and any additional casing that may be needed for future expansion to FM 1889 shall be coordinated with the Districts Engineer. Reference the **Proposed Utility Improvements** exhibit contained in *Appendix E*.

V. Wastewater Improvements

No wastewater lines are proposed. The City of Corpus Christi Master Plan does not indicate plans for wastewater service along this new section of County Road 52. Additionally, as per correspondence with the City of Corpus Christi Wastewater Department, there are no plans to develop wastewater improvements along this new County Road 52 section. A corridor will be provided for the future installation of these utilities. Reference the **Proposed Utility Improvements** exhibit contained in *Appendix E*.

VI. Dry Utility Improvements

No gas lines are proposed. The City of Corpus Christi Master Plan does not indicate plans for gas service along this new section of County Road 52. Additionally, as per correspondence with the City of Corpus Christi Gas Department, there are no plans to develop gas improvements along this new County Road 52 section. A corridor will be provided for the future installation of these utilities. Reference the **Proposed Utility Improvements** exhibit contained in *Appendix E*.

Currently there is no budget for street lighting on the project. At a minimum, it is recommended that lights be placed at the intersections of County Road 69 and FM 1889.

NEI will visit with the Nueces Electric Cooperative to see if they intend on extending power lines to FM 1889, and in doing so would be willing to add some lighting. Overhead (OH) electric lines will be located on the north side of the County Road 52 extension, approximately one (1) foot inside the right-of-way line.

There is an existing petroleum pipeline located in the area of improvements, but it is within the section of roadway constructed by the Nueces Electric Cooperative. In addition, there are no other franchise/private utilities within the project area.

VII. Right-Of-Way & Acquisition

The City is in the process of acquiring the required right-of-way. The basic width of the right-of-way is 100 feet. Reference the **Right-Of-Way & Acquisition** exhibit contained in *Appendix G*.

An additional easement is required for the 12" waterline installed from County Road 69 to the Valley View Subdivision. This should be a 10 foot utility easement dedicated to the Nueces County Water Control and Improvement District No. 3. All other proposed improvements shall be completed within the new right-of-way.

VIII. Traffic Control & Texas Department of Transportation

The construction issues of the extension of County Road 52 are simplified because there is no pre-existing roadway. Thus traffic through this area will not be a factor. Traffic control will be required at the County Road 69 and FM 1889 intersections during the County Road 59 tie-ins. At these locations construction signage and barricading should be sufficient to provide adequate safety for the workers involved. Reference the **Traffic Control Plan** exhibit contained in *Appendix H*.

As per correspondence with Texas Department of Transportation, they will review the section along FM 1889 to verify if any improvements will be needed due to the new intersection.

VIII. Environmental Issues

The assessment included a detailed review of historical regulatory records for the area surrounding the project site. Reference the **Regulatory Screening Assessment Report** contained in *Appendix D*. No sites near the project were identified in Leaking Petroleum Storage Tank (LPST) and Underground Storage Tank (UST) databases. Based on the information received there are no current open sites within the project limits.

APPENDIX A
Existing Conditions Maps

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Corpus Christi
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TBPE Firm Registration No. F-000355

COUNTY ROAD 52 EXTENSION FROM CR69 TO FM 1889



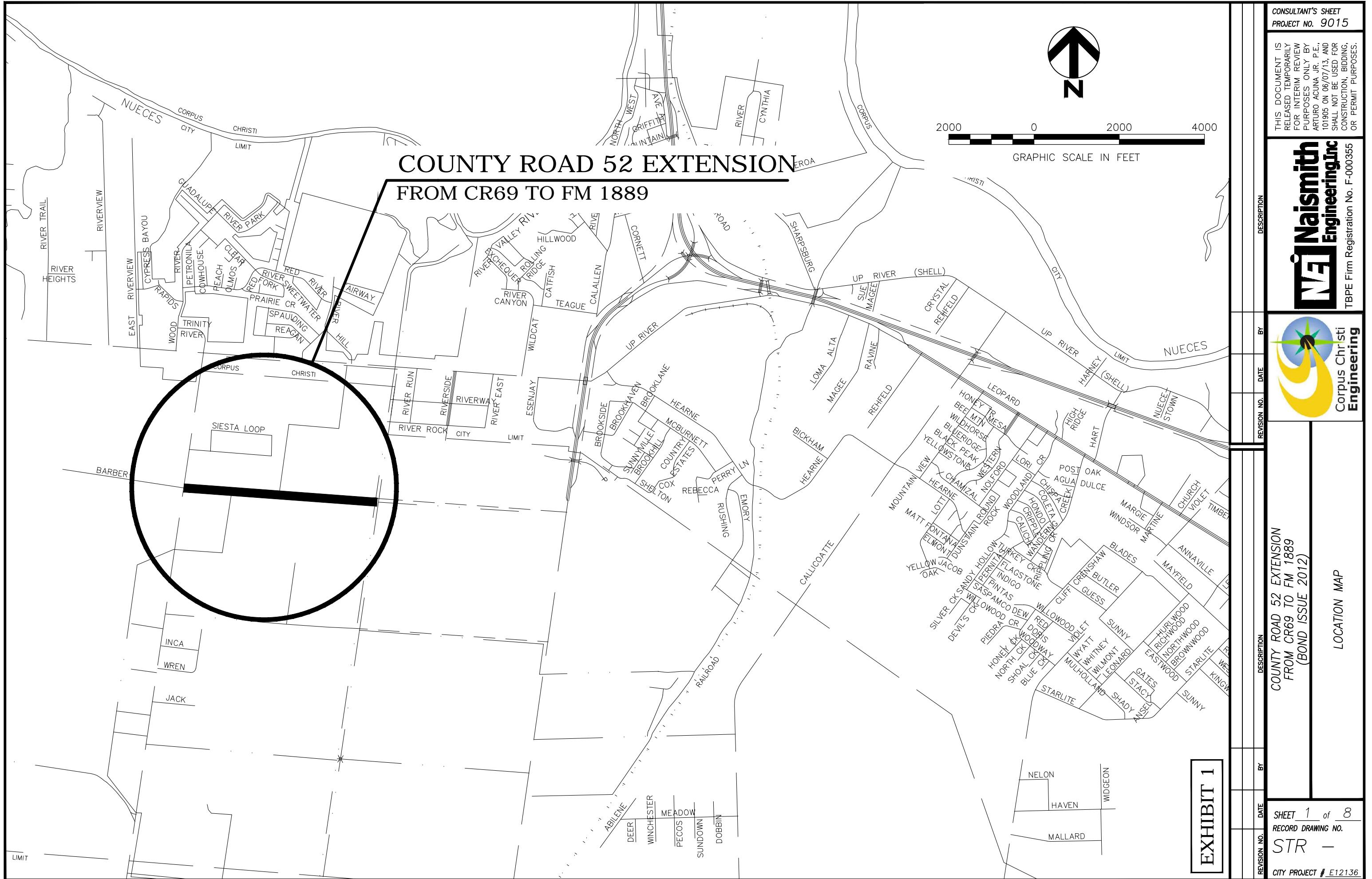
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GRAPHIC SCALE IN FEET

COUNTY ROAD 52 EXTENSION
FROM CR69 TO FM 1889
(BOND ISSUE 2012)

LOCATION MAP

EXHIBIT 1

SHEET 1 of 8
RECORD DRAWING NO.
STR -
CITY PROJECT # E12136



COUNTY ROAD 52 EXTENSION
FROM CR69 TO FM 1889



GRAPHIC SCALE IN FEET

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CONSULTANT'S SHEET
PROJECT NO. 9015

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NaiSmith
Engineering Inc.



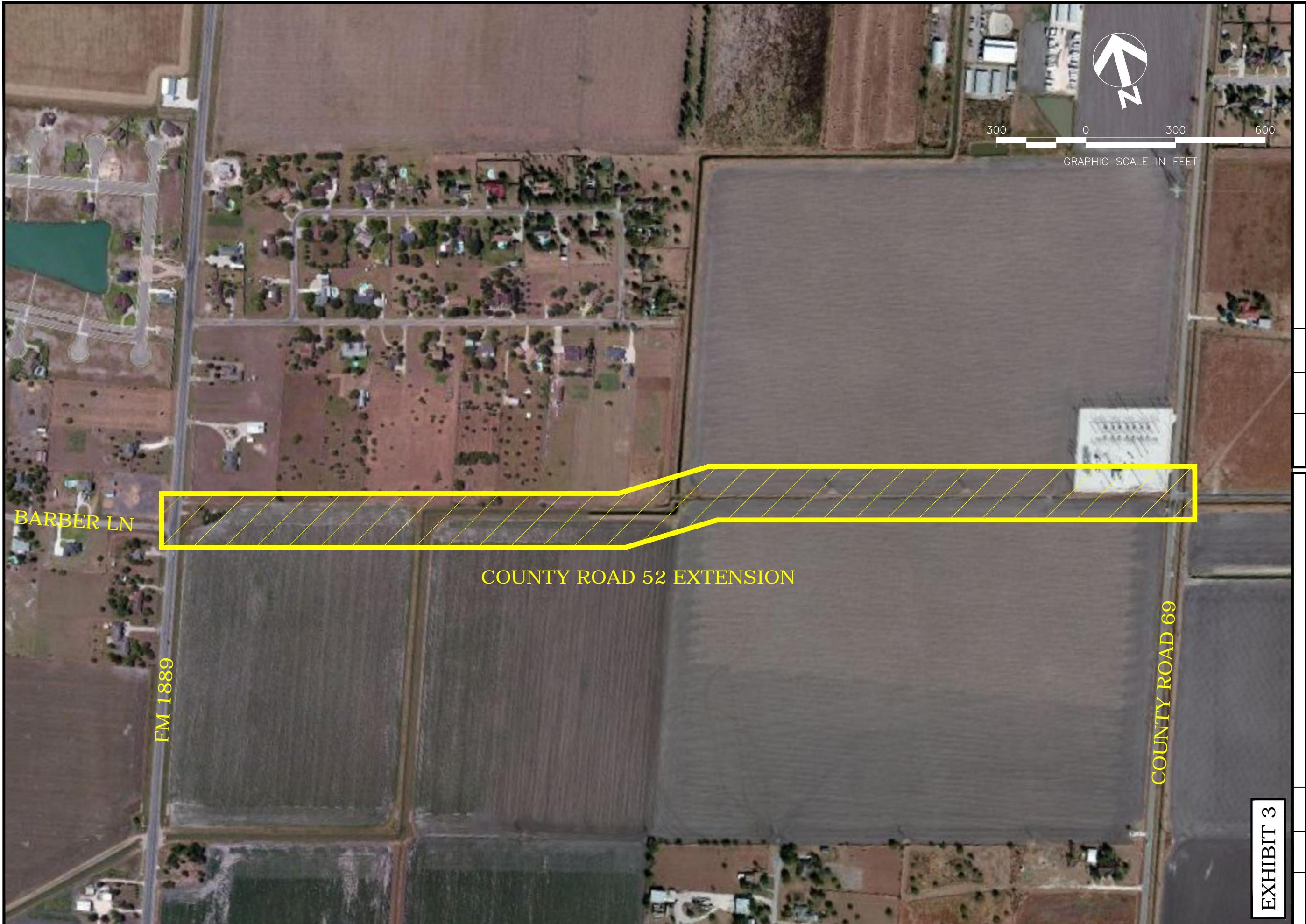
Corpus Christi
Engineering

VICINITY MAP

COUNTY ROAD 32 EXTENSION
FROM CR69 TO FM 1889
(BOND ISSUE 2012)

EXHIBIT 2

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Naismith
Engineering Inc

Corpus Christi
Engineering

TBPE Firm Registration No. F-000355

REVISION NO. DATE BY DESCRIPTION
COUNTY ROAD 52 EXTENSION
FROM CR69 TO FM 1889
(BOND ISSUE 2012)

LOCATION MAP

SHEET 3 of 8
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CITY PROJECT # E12136

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**Naismith
Engineering Inc**

TBPE Firm Registration No. F-000355

Corpus Christi
Engineering

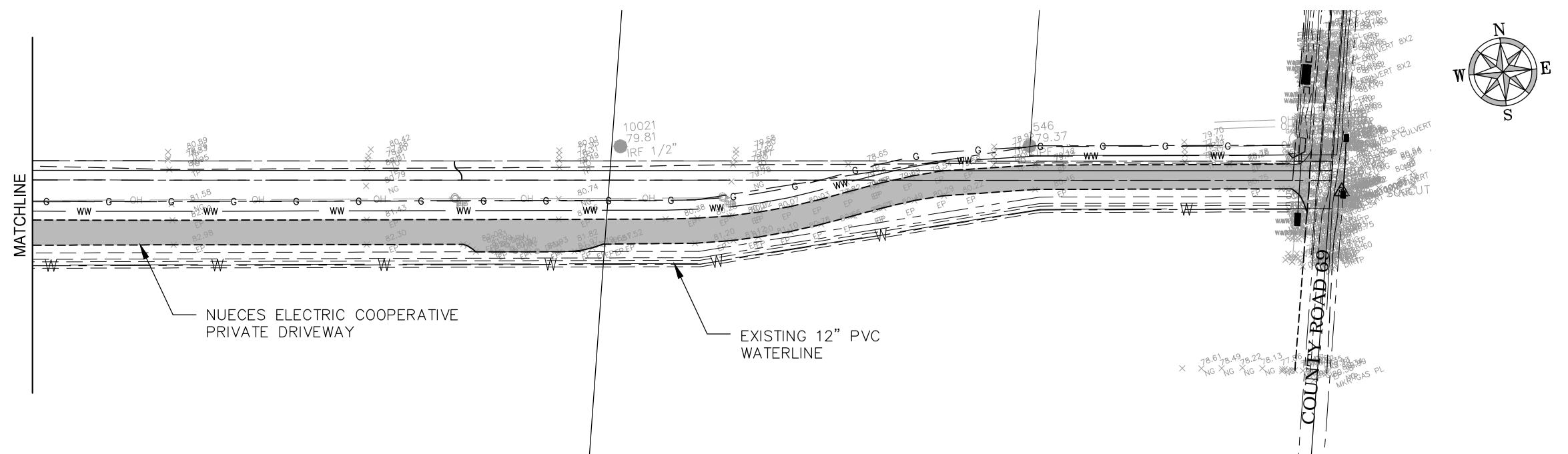
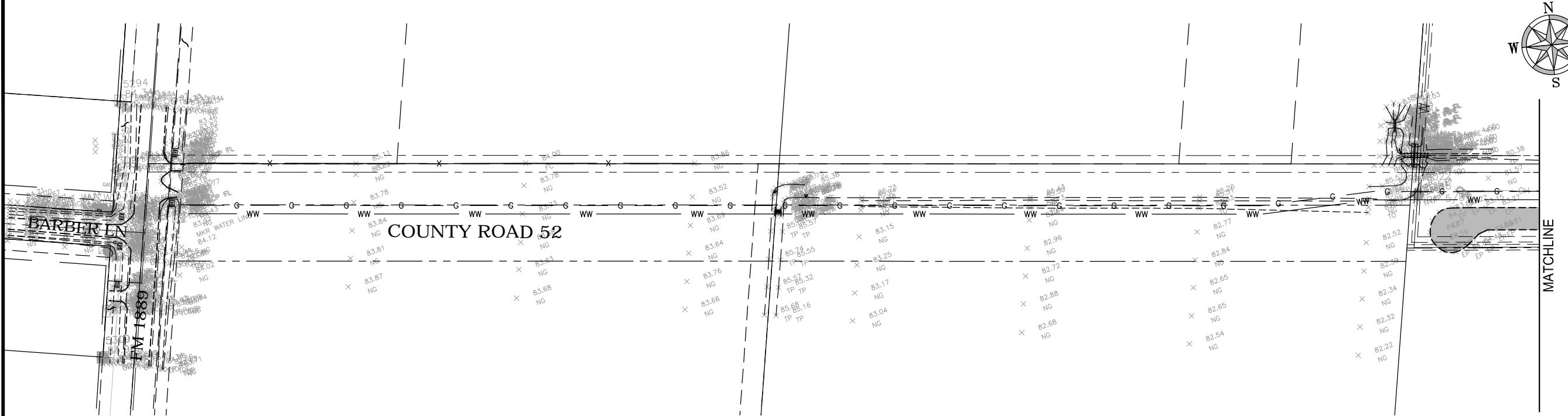


EXHIBIT 4

COUNTY ROAD 52 EXTENSION
FROM CR 69 TO FM 1889
(BOND ISSUE 2012)

EXISTING CONDITIONS

SHEET 4 of 8
RECORD DRAWING NO.
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CITY PROJECT # E12136

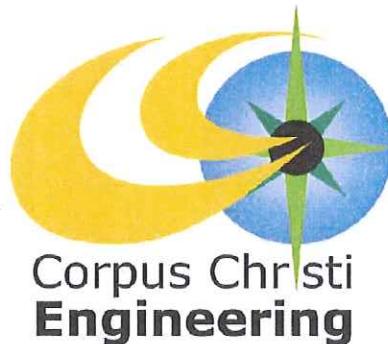
APPENDIX C

Drainage Evaluation Report

**DRAINAGE EVALUATION
COUNTY ROAD 52 EXTENSION
From County Road 69 to FM 1889
(BOND ISSUE 2012 – CITY PROJECT NO. E12136)**

SUBMITTED TO:

**CITY OF CORPUS CHRISTI, TEXAS
DEPARTMENT OF ENGINEERING SERVICES**



SUBMITTED BY:



TBPE FIRM REGISTRATION NO. F-000355

Telephone: (361) 814-9900

Fax: (361) 814-4401

June 7, 2013

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APPENDIX

Exhibit 1 – Existing Hydrological and Hydraulic Study

Exhibit 2 – Proposed Hydrological and Hydraulic Study

Exhibit 3 –Proposed CR 52 Improvements

Exhibit 4 –Proposed Swale Sections

Exhibit 5 – Existing Canal Drainage Structure Section

Attachment 1 – FM 1889 TXDOT Drainage Map

Attachment 2 – Robstown Nueces County Master Drainage Plan Improvements

Attachment 3 – CR 52 and CR 69 Improvements

Attachment 4 – City Draft Master Drainage Plan M08 M09 and L08

I. SCOPE OF WORK

Naismith Engineering, Inc. (NEI) has been contracted by the City of Corpus Christi to complete the plans and specifications for the construction of the CR 52 Extension Street Improvements.

The project includes the extension of CR 52 from CR 69 to FM 1889. The work includes the construction of a roadway and associated drainage improvements.

NEI has been tasked with evaluating the existing drainage system and developing recommendations for improvements. The basic tasks include:

- Preparing an updated Hydrologic study of the existing CR 52 Sub-Basin and provide calculations.
- Evaluate the capacity of existing drainage structure at the irrigation canal.
- Evaluate drainage design on the existing CR 52.
- Preparing an updated Hydraulic study of the CR 52 Sub-Basin and provide calculations.
- Use the models developed to design for new drainage features for the CR 52 Extension.

II. CR 52 EXTENSION SYSTEM HISTORY

Existing Drainage Basins and Sub-Basins

The CR 52 drainage system, approximately 309.26 acres, drains the area generally bound by CR 69 and FM 1889, from South of FM 624 to the CR 52 extension. The area can be broken down into two basins with an outfall to FM 1889 composed of existing sub-basin 1 and an outfall to CR 69 composed of existing sub-basin 2-5.

Exhibit I shows the current drainage area for the CR 52 System. The system is essentially composed of five sub-basins. Basin 1 includes an area bound by FM 624 to the north, FM 1889 to the west and the CR 52 extension to the south. The drainage in this area surface drains towards a roadside ditch at FM 1889. Basin 2 includes an area bound by FM 624 to the north, the irrigation canal to the south, the irrigation canal to the east and Basin 1 to the west. The drainage in this area surface drains towards a swale on the eastern side of the Valley View subdivision to an existing crossing structure at the irrigation canal. Basin 3 includes an area bound by FM 624 to the north, the existing portion of CR 52 (Cooperative Way) to the south, the irrigation canal to the west and Basin 4 to the east. The drainage in this area surface drains towards a swale on the northern side of the existing portion of CR 52 (Cooperative Way). Basin 4 includes an area bound by FM 624 to the north, the existing portion of CR 52 (Cooperative Way) to the south, Basin 3 to the west and CR 69 to the east. The drainage in this area surface drains towards a roadside swale on CR 69. Basin 5 includes an area bound by Basin 3 to the north, the existing portion of Cr 52 (Cooperative Way) to the south, the irrigation canal to the west and the existing portion of CR 52 to the east. The drainage in this area surface drains towards a proposed swale that has not been constructed to the north.

Txdot FM 1889 Improvements

Txdot FM 1889 Plans were obtained by Naismith (NEI) during the 2010 Nueces County Drainage Master Plan study. The eastern drainage basin shown in the plans, dated 2002, show a narrow strip of contributing area flowing into the FM 1889 roadside ditch. The flow in the ditch continues south to a proposed siphone underneath the existing irrigation canal. The drainage area plan sheet and calculations have been included in Attachment #1.

Nueces County Drainage Master Plan

In 2010 Naismith Engineering completed a Drainage Master Plan for Nueces County. The area of the proposed road improvements is included in this master plan. Recommendations for this area include an 8' deep ditch that would parallel the proposed CR 52 improvements from 1889 east, then cross at 2-6'X6' R.C.B.s and continue south. The Master plan for the proposed improvements has been included in Attachment #2.

Nueces County Drainage Master Plan Implementation CR 69

In 2010 Naismith Engineering completed an implementation plan for Nueces County for County Road 69. The plan included proposed improvements to the driveway crossings and county road crossings to help alleviate drainage issues. The plan called for the installation of dual 6'x4' box culverts from CR 52 to CR 48. During recent field visits it was determined that 10'x3' box culverts were installed.

CR 52 and CR 69 Improvements

In 2012 CR 52 was re-constructed from US 77 access road to CR 69. CR 52 was also extended west of CR 69 for the development of a Nueces Electric Coop (NEC) facility. This portion of CR 52 drainage will be evaluated as part of this project. During the same project a portion of CR 69 from CR 52 to FM 624 was also improved. Plans indicate that a proposed ditch was installed on the north side of the new CR 52 extension heading east then tying into the ditch on CR 69. The frequency used for the design of the ditch was a 2 year 24 hour storm event. The drainage area plan sheet and calculations have been included in Attachment #3.

City of Corpus Christi Stormwater Master Plan (Draft)

At the time of this report (2013), a new Drainage Master Plan is in the process of being reviewed and adopted by the City of Corpus Christi. This master plan recommended new trapezoidal ditch 7.6' deep with a 40' bottom at the new CR 52 extension.

At the time of our current analysis (2013), the City had not adopted the new Drainage Master Plan for this area and was continuing to operate under the requirements of the old Master Plan for this Area. The draft Drainage Master Plans Sheets have been included in Attachment #4.

III. ANALYSIS

III. A Data

In an effort to accurately evaluate the existing system, NEI completed a thorough investigation into the existing system. Including the following:

- Aerials with Contour Maps and Property Boundaries were utilized in developing basins and sub-basins.
- All existing culverts, ditches and roadways were surveyed as well as the existing canal drainage structure.
- Survey Data was combined with Aerial Photo Data to more accurately depict sub-basins.
- Record drawings were acquired from the City and TxDOT.

III.B Software Utilized

Naismith Engineering, Inc. utilized several computer programs to evaluate the existing system.

- StormCad was utilized to complete an accurate computer model for the entire CR 52 System. The model takes into consideration the sub-basin areas, time of concentrations, swale size, existing canal structure, culvert type, culvert sizes, and boundary conditions. The model is also capable of calculating runoff based on the intensity tables which are entered into the system.
- ArcGIS was utilized to organize the field data, develop exhibits and develop basin delineations.

III.C Computer Models

The use of the StormCad software for analysis results in detailed calculation of the time of concentration (Tc), and the rainfall intensity (I), and the amount of runoff calculated for each point along the collection system. In order for the model to be as accurate as possible, the following basic steps were followed:

- Sub-Basins were delineated and imported into the system through the use of GIS.
- Runoff coefficients were determined by reviewing the existing zoning maps for the area as well as reviewing existing aerial photos to determine the current development. A weighted coefficient (Cw) was calculated and used.
- The time of concentration (Tc) was determined for each Sub-basin using Txdot velocity tables for overland flow. The expected runoff for each sub-basin was calculated by the software based on Area, Calculated Intensity, and weighted coefficient (Cw). The expected runoff from these small sub-basins was then routed to junction nodes on the system.
- The rainfall intensity duration frequency (IDF) utilized in this analysis was based on data for our area as issued by the USGS. This is the same data included in Table 3-4 of the City's DRAFT drainage Criteria Manual. The data was incorporated into the StormCad Model.
- The model allows the user to choose a storm for each different analysis. The model automatically adjusts the intensity rates based on the time of concentration along the point on the system.
- Once the model is run, the results can be viewed and analyzed.

III.D Evaluation of Existing System

Once the model had been set up and evaluated, the efficiency of the existing system was checked for a 5 year storm event. The results of the analysis indicated that the existing swale to the North of the existing CR 52 (Cooperative Way) that oufalls at CR 69 is not capable of efficiently conveying a 5-Year storm event. The existing canal crossing structure Exhibit V and the existing box culvert at CR 69 are capable of conveining flows under existing conditions.

III.E Proposed Improvements

- NEI evaluated the proposed CR 52 system from CR 69 to FM 1889 and developed minimum recommendations for a 5-Year storm event. All data utilized to evaluate the system was based

on existing conditions. Aerials along with field visits were used in determining the appropriate C value coefficient to be used. The existing canal crossing structure Exhibit V and the existing box culvert at CR 69 are capable of conveying flows under proposed conditions. Outlined below is a comparison of existing flows to the proposed flows.

	Existing Sub-Basins Exhibit 1	Areas (Ac)	5-Year (cfs)
FM 1889 Outfall	1	8.41	16.37
CR 69 Outfall	2-5	300.85	155.31

	Proposed Sub-Basins Exhibit 2	Areas (Ac)	5-Year (cfs)
FM 1889 Outfall	1,3-4	8.41	16.79
CR 69 Outfall	2,5-12	323.52	163.64

5-YEAR IMPROVEMENTS

Exhibit III indicates the approximate location and size of the proposed culvert crossing and swale size recommendations required for a 5-Year Storm Event.

V. RECOMMENDATIONS.

FM 1889

It is recommended that 2-18" R.C.P. culverts be installed at the ditch crossing for the connection to FM 1889. The proposed sub-basin three and four have been delineated to allow drainage from the existing grade break of the basin to enter the FM 1889 road side ditch. Contributing area to this outfall has not increased and flow to this area has remained approximately the same.

CR 52 Extension to the Existing CR 52 (Cooperative Way)

Sub-basin 6 and 11 have been delineated to design small road side ditches that drain runoff from the south side of the proposed road extension through 18" R.C.P. crossings to the north. The ditch design is based on the min. maintainable section. Sub-basin 10 uses the same min. section to capture runoff between the canal and roadway and provide drainage to the east.

The proposed roadway has added additional contributing area to the system, shown as basin number 5, that will no longer surface drain to the south. It is recommended that a drainage ditch be constructed along the northern side of the roadway to direct drainage through the existing drainage canal opening. With the addition of this sub-basin 5 and existing contributing basin 2 and 7 the existing structure can handle the proposed flow for a 5 year storm event.

Existing CR 52 (Cooperative Way)

Sub-basin 12 is part of the original drainage system planned for the existing CR 52 (Cooperative Way). It is recommended that the current proposed roadside ditch be increased to be able to convey additional flow from sub-basin 10 and 11.

It is recommended that the existing drainage ditch to the North that drains the area from the existing drainage canal crossing towards CR '69 be improved.

Existing CR 52 (Cooperative Way) 8'x2' R.C.B

The existing 8'x2' R.C.B. at CR 69 is capable of conveying a 5 year storm event under current conditions.

APPENDIX

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EXHIBIT 1

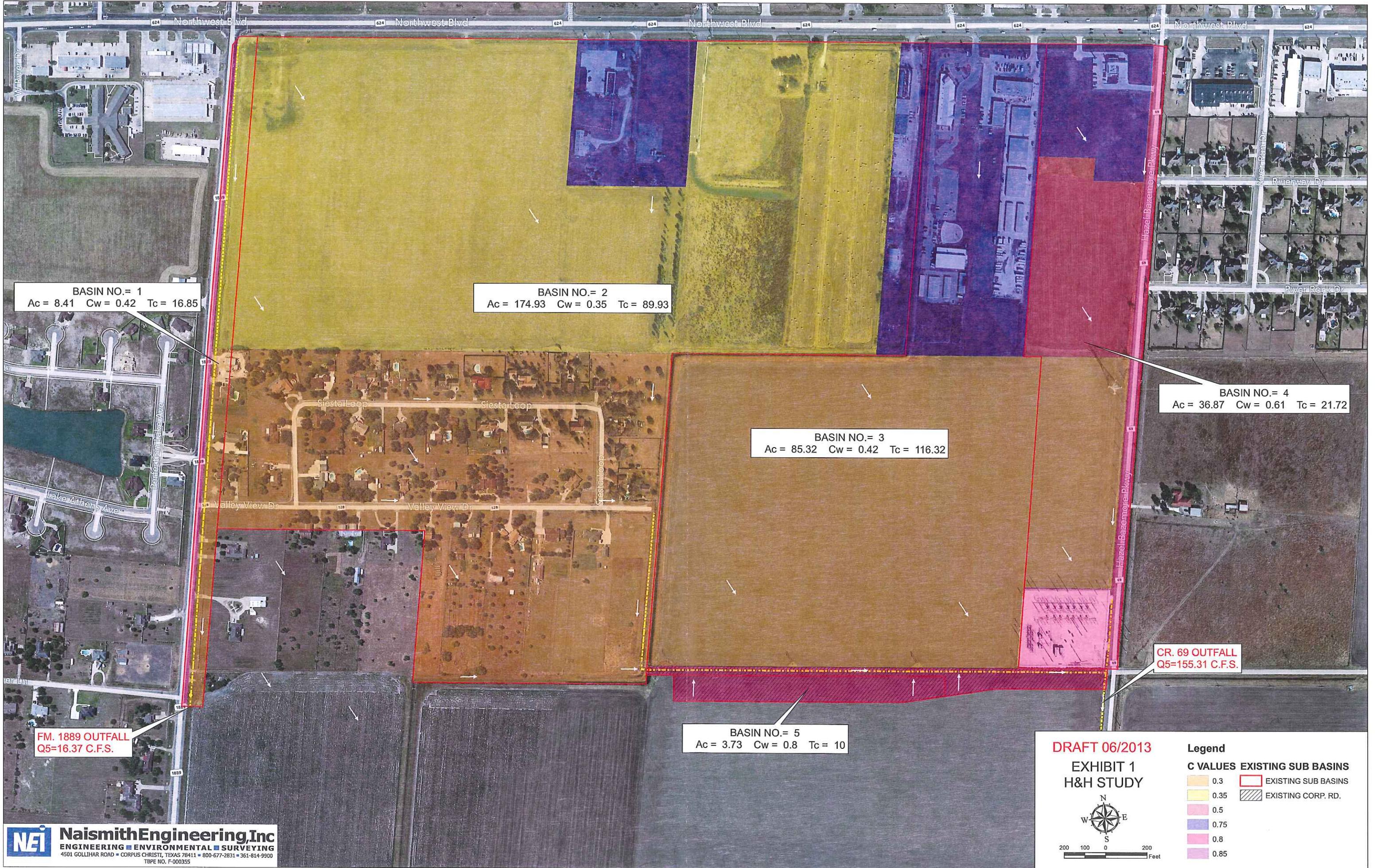


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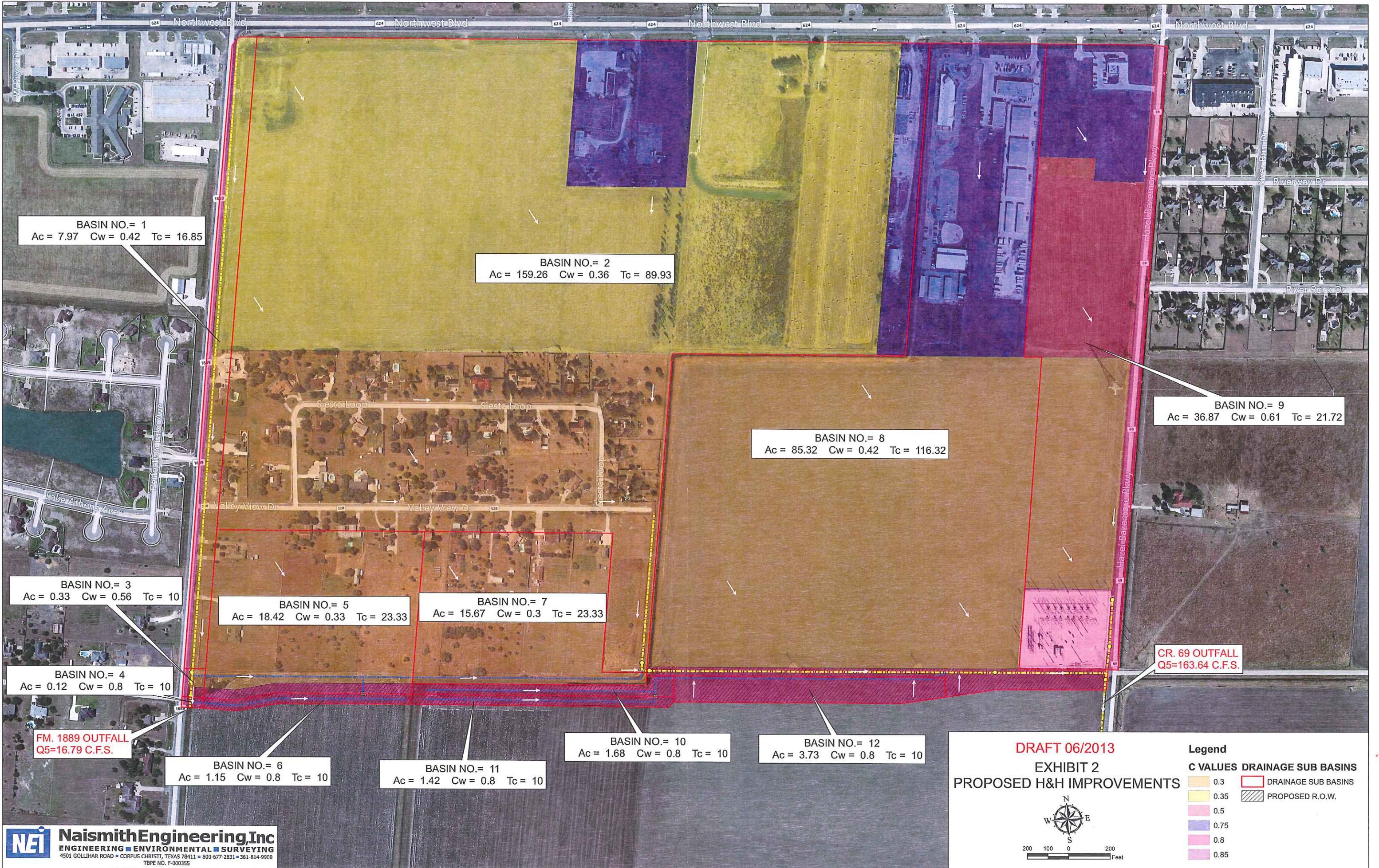
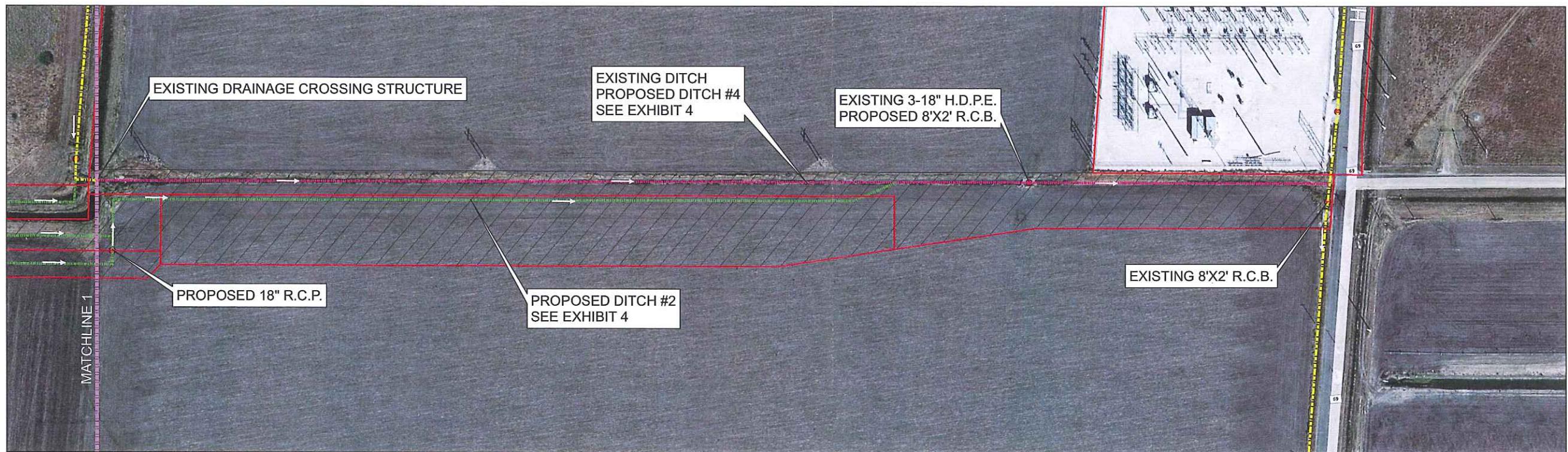
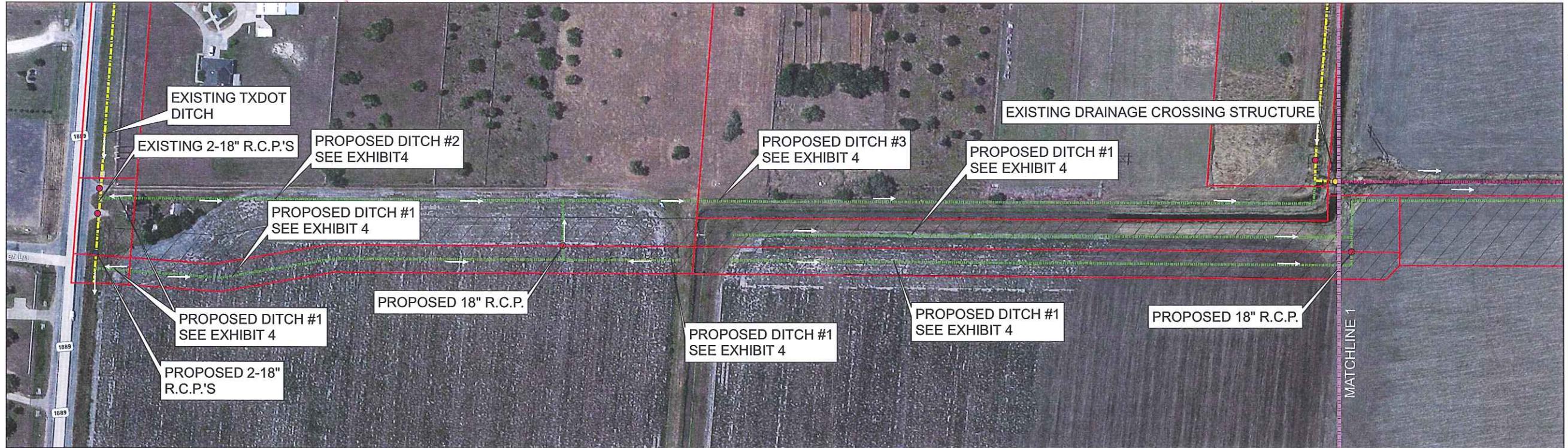


EXHIBIT 3



DRAFT 06/2013

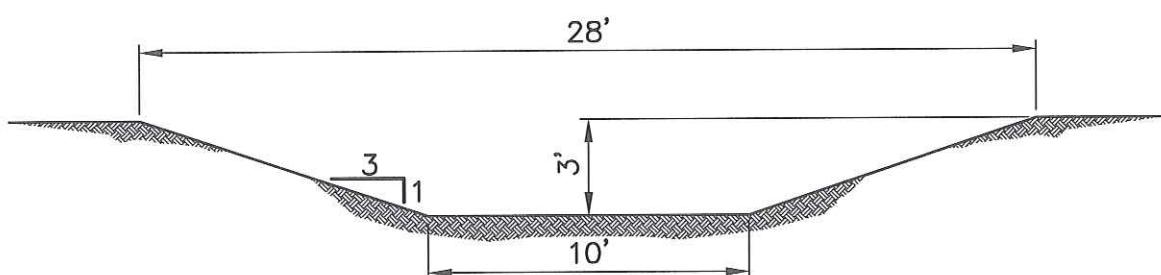
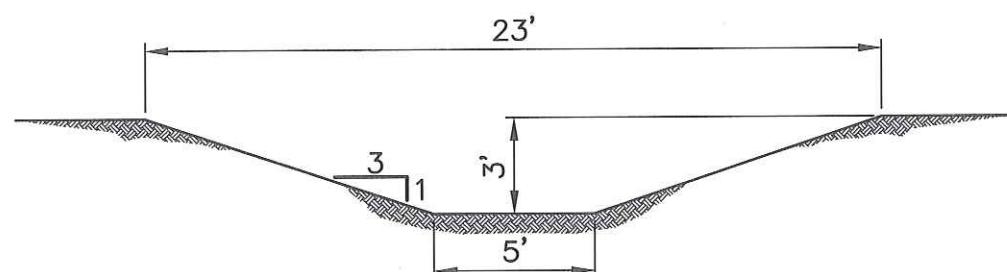
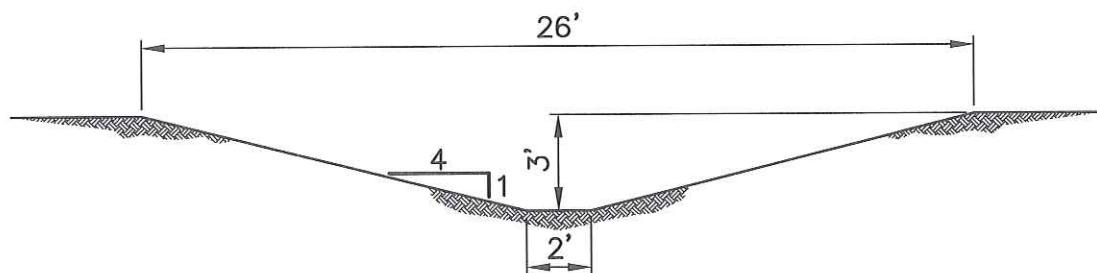
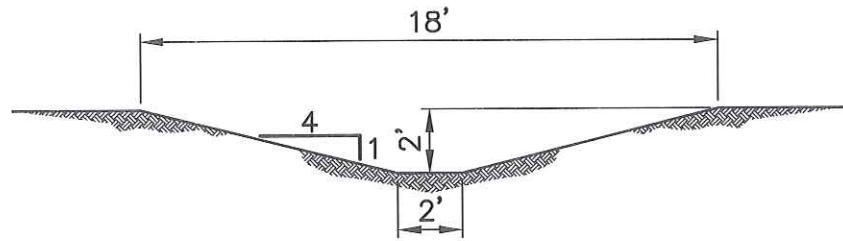
**EXHIBIT 3
PROPOSED IMPROVEMENT**

Legend	
DRAINAGE SUB BASINS	
DRAINAGE SUB BASINS	
PROPOSED R.O.W.	
PROPOSED R.O.W.	
SWALES	
EXISTING	
PROPOSED	
RE-GRADING	



100 50 0 100
Feet

EXHIBIT 4



Drawn By : TL
Checked By : GJO
Approved By : GJO
Project No. : 9015
Scale : 1"=6'
Date : 6-6-13
Revision : 0

OFFICE LOCATION :
4501 Goliad Rd.
Corpus Christi, Texas 78411
P.O. Box 3099
Corpus Christi, Texas 78463
(361)-814-9900

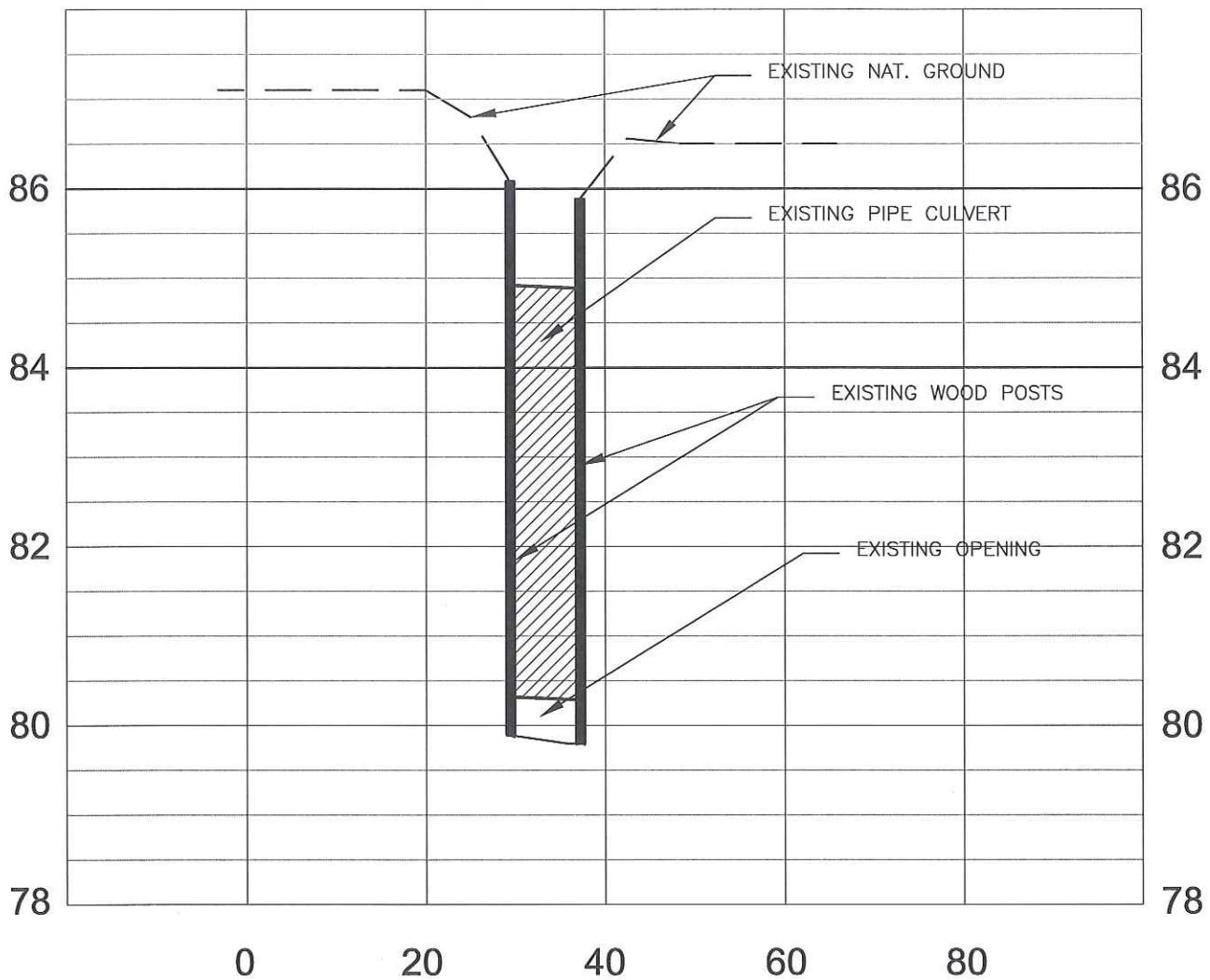


DRAFT 06/2013
EXHIBIT 4
PROPOSED DITCH SECTIONS

Dwg. File: 9015-EX-4
1

Sheet 1 Of 1

EXHIBIT 5



**IRRIGATION CHANNEL
DRAINAGE CROSSING**

6'
0'
VERTICAL
GRAPHIC SCALE

HORIZONTAL GRAPHIC SCALE
0 30 60 120

Drawn By : GJO
Checked By : GJO
Approved By : GJO
Project No. : 8015
Scale : N.T.S.
Date : 06/2013
Revision : 0

OFFICE LOCATION :
4501 Goliad Rd.
Corpus Christi, Texas 78411
P.O. Box 3099
Corpus Christi, Texas 78463
(361)-814-9900



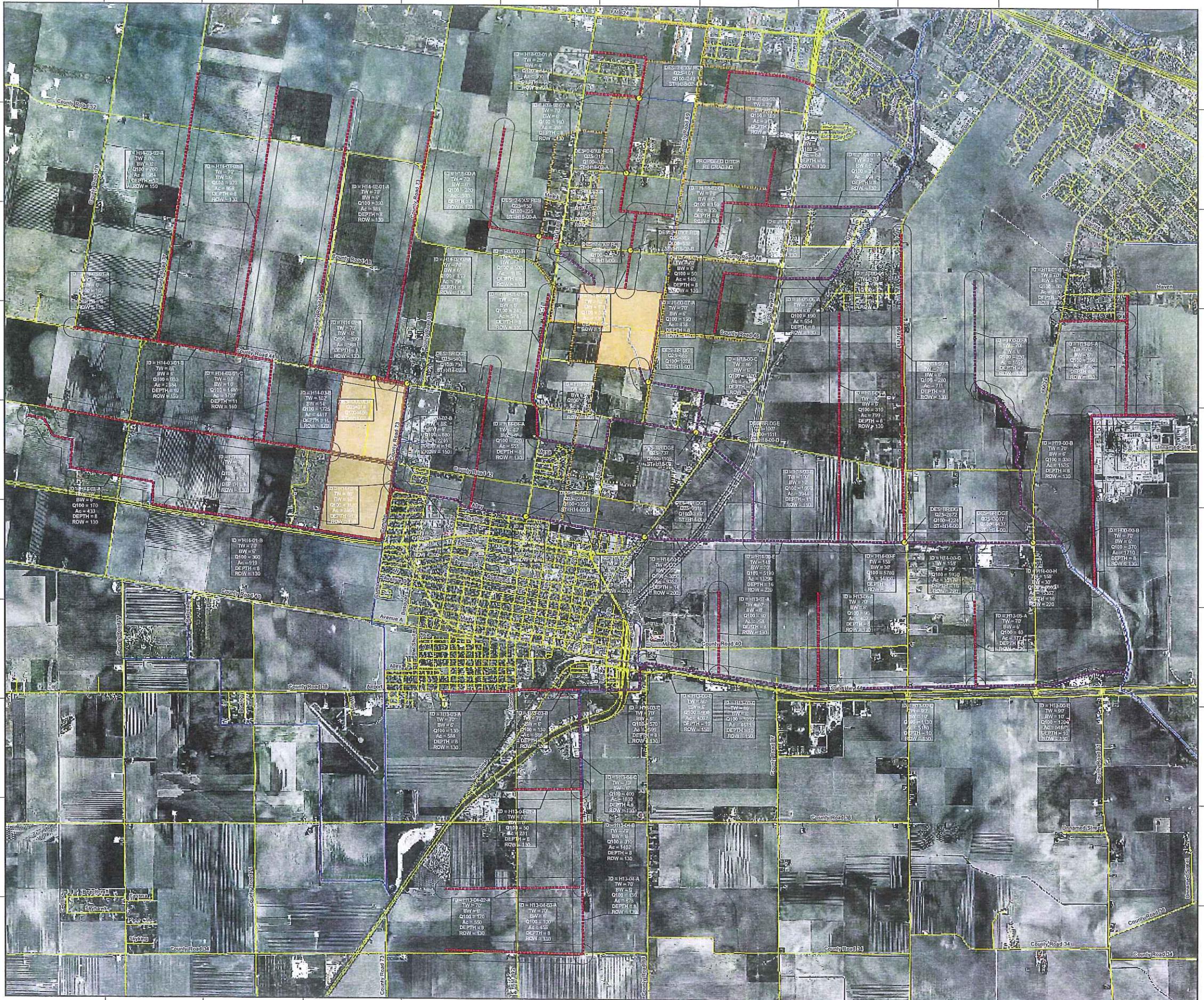
**IRRIGATION CHANNEL
DRAINAGE CROSSING
EXHIBIT 5
PROPOSED DITCH SECTIONS**

Dwg. File: 8015-EXHIBIT 5
5
Sheet 5 Of 5

ATTACHMENT 1



ATTACHMENT 2

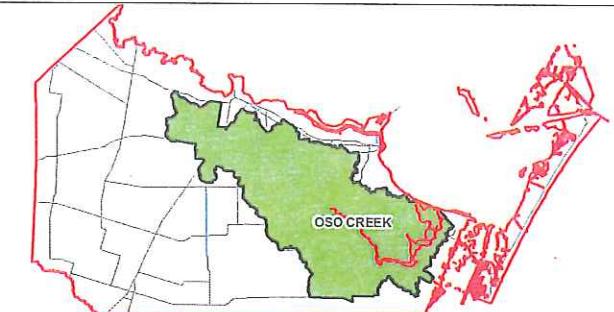


NaismithEngineering, Inc.
ENGINEERING ■ ENVIRONMENTAL ■ SURVEYING
4501 GOILLIARD ROAD ■ CORPUS CHRISTI, TEXAS 78411 ■ 800-677-2831 ■ 361-814-3900
TPB# NO. F-00035

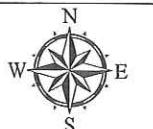
**CSE Civil Systems
Engineering, Inc.**
9894 BISSONNET ST., STE404
HOUSTON, TX 77036
(713) 782-3811

URS
9400 AMBERGLEM BLVD.
AUSTIN, TX 78729
(512) 419-5186

DOL, INC.
DOS LOGISTICS, INC.
5 N. CARANCAHA
CORPUS CHRISTI, TX 78478
512-881-9490



KEY MAP



MAP | FGFND

- CROSSING IMPROVEMENTS
 - DITCH WIDENING
 - NEW DITCH CONSTRUCTION
 -  DETENTION BASIN
 - DITCH-TRIB
 - CHANNEL
 - CANAL
 - ROADSIDE
 -  UNKNOWN-CANAL?

NUECES COUNTY MASTER DRAINAGE PLAN

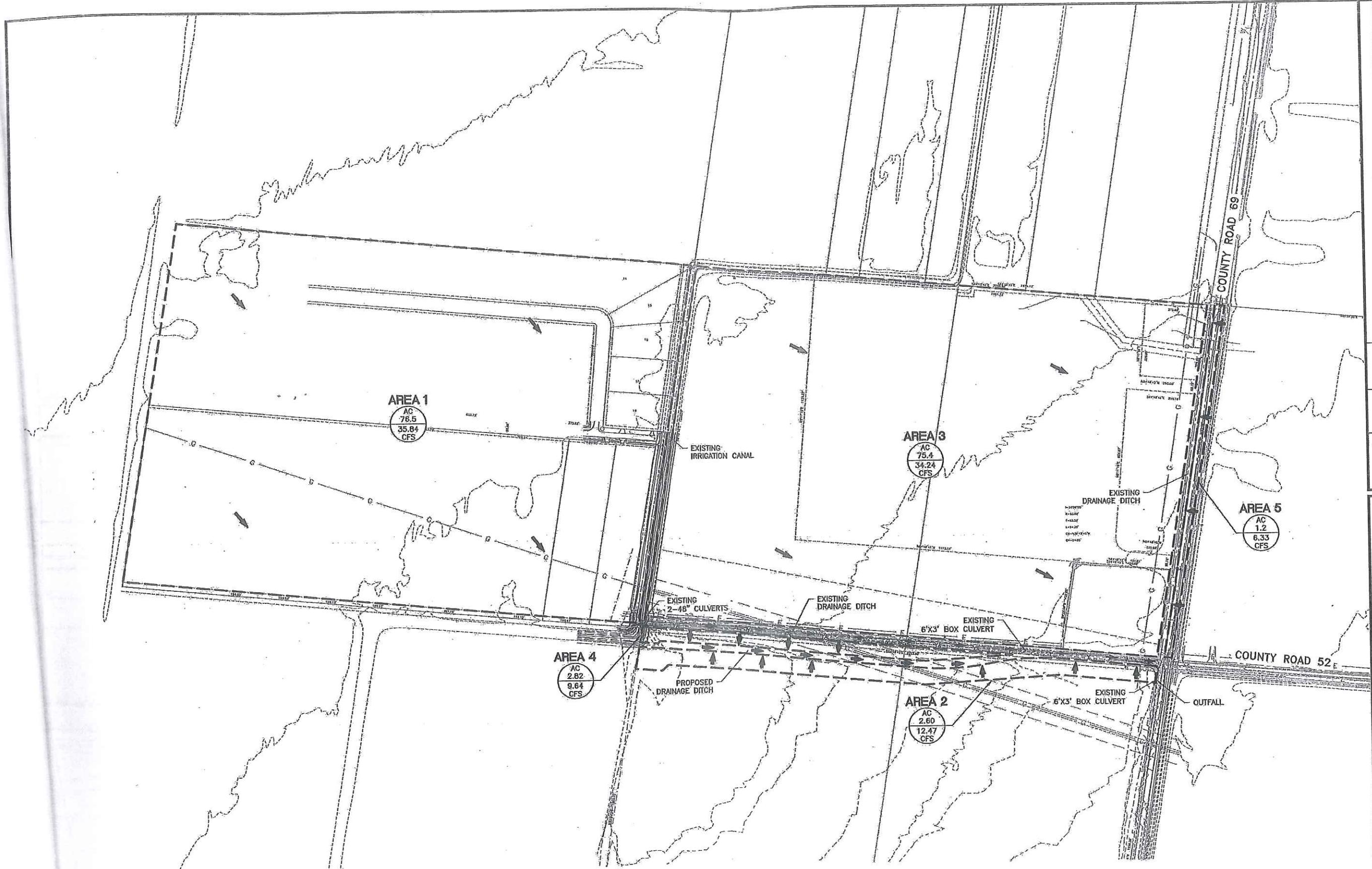
EXHIBIT ONE

UPPER OSO AREA MASTER PLAN

DECEMBER 2009

EXHIBIT

ATTACHMENT 3



RAINAGE MAP LEGEND

→ DRAINAGE AREA BOUNDARY
 DRAINAGE FLOW DIRECTION
XXX DRAINAGE AREA NAME
 AC DRAINAGE AREA SIZE
 XXXX
 XXXX
 CFS CUMULATIVE FLOW

A DRAINAGE AREA MAP
11 11 SCALE: 1"=200'

NOTE:

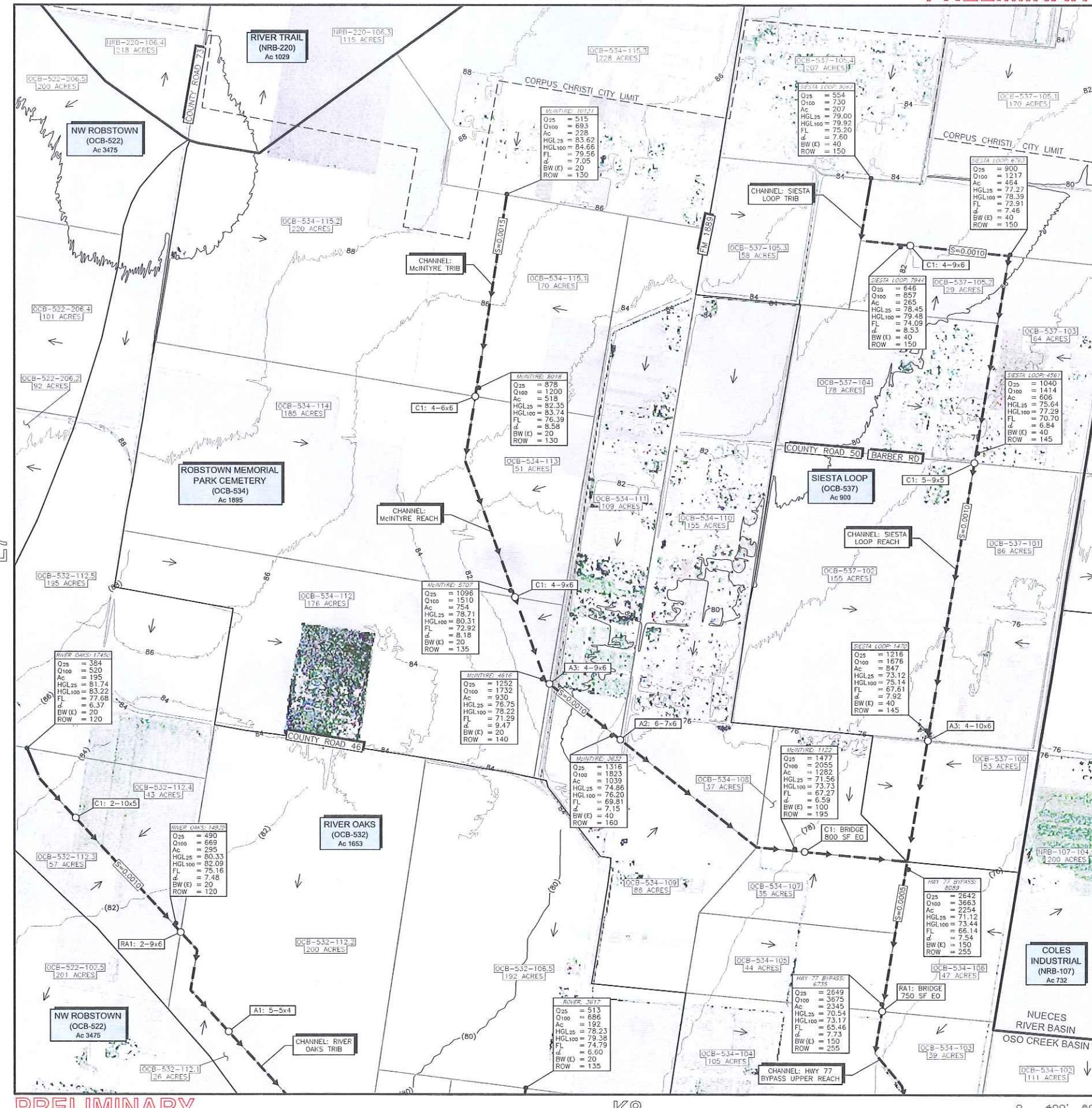
1. USGS MAPS AND CONTOURS WERE USED TO DETERMINE PEAK FLOWS FOR AREA 1 AND AREA 3.
2. DESIGN STORM IS 2 YEAR EVENT

REVISION NO.	DATE	BY	DESCRIPTION	REVISION NO.	DATE	BY	DESCRIPTION
			NEC PRIVATE DRIVEWAY (WEST OF COUNTY ROAD 69)				Nueces Electric Cooperative
							DRAINAGE AREA MAP
							SHEET <u>11</u> of <u>31</u>

ATTACHMENT 4

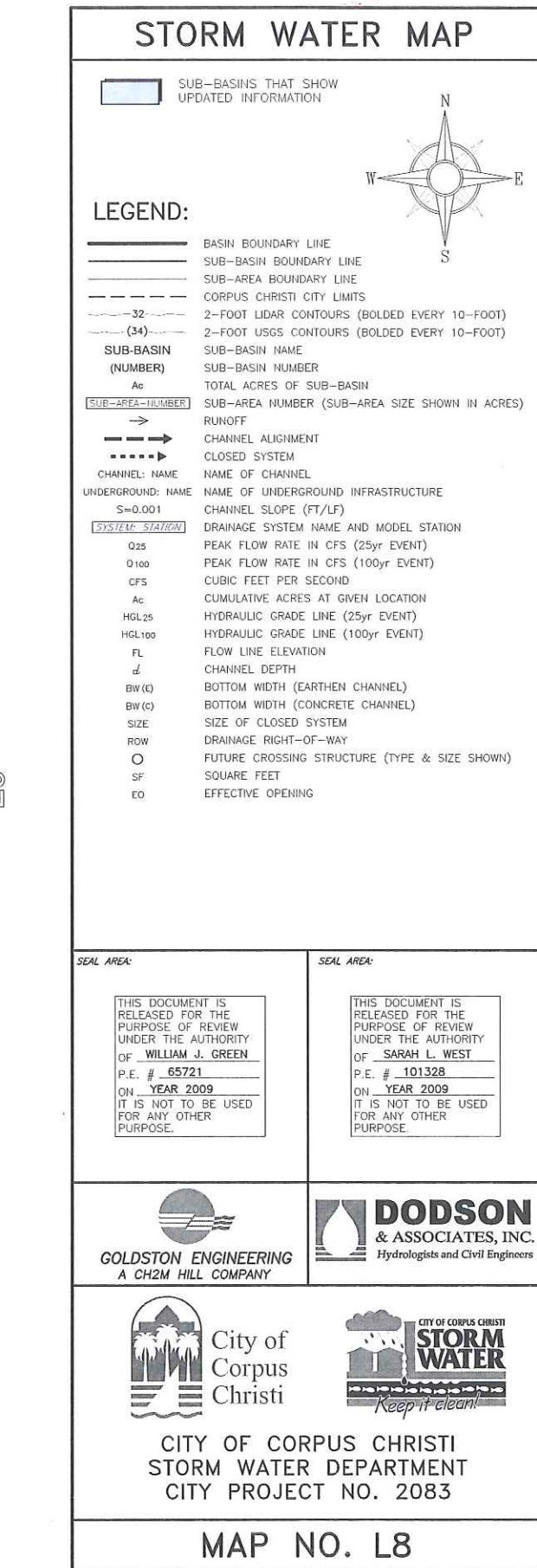
M8

PRELIMINARY



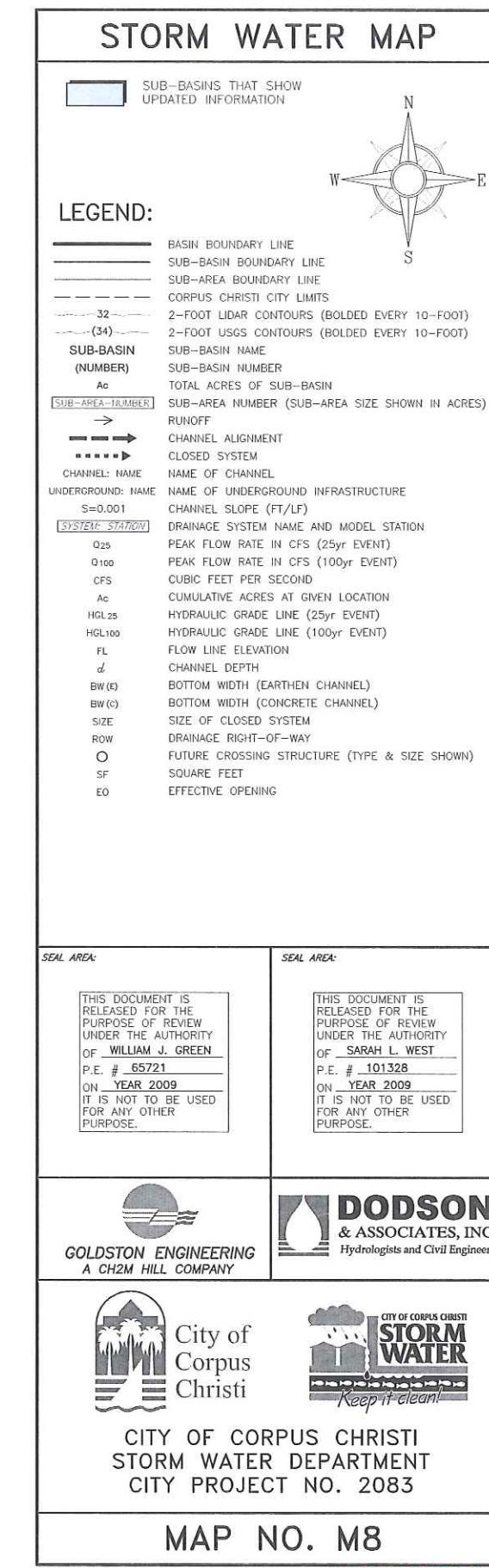
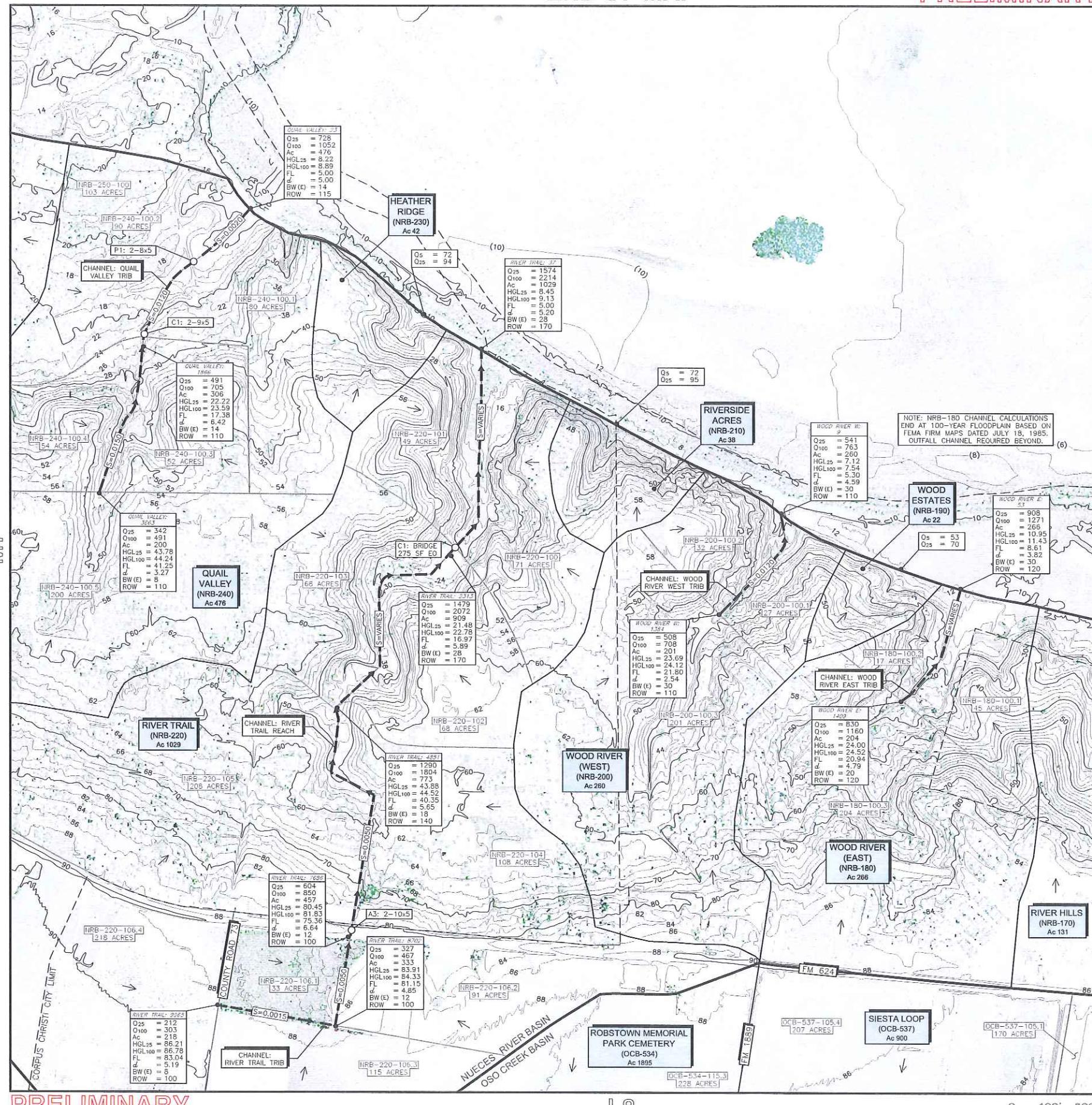
PRELIMINARY

K8



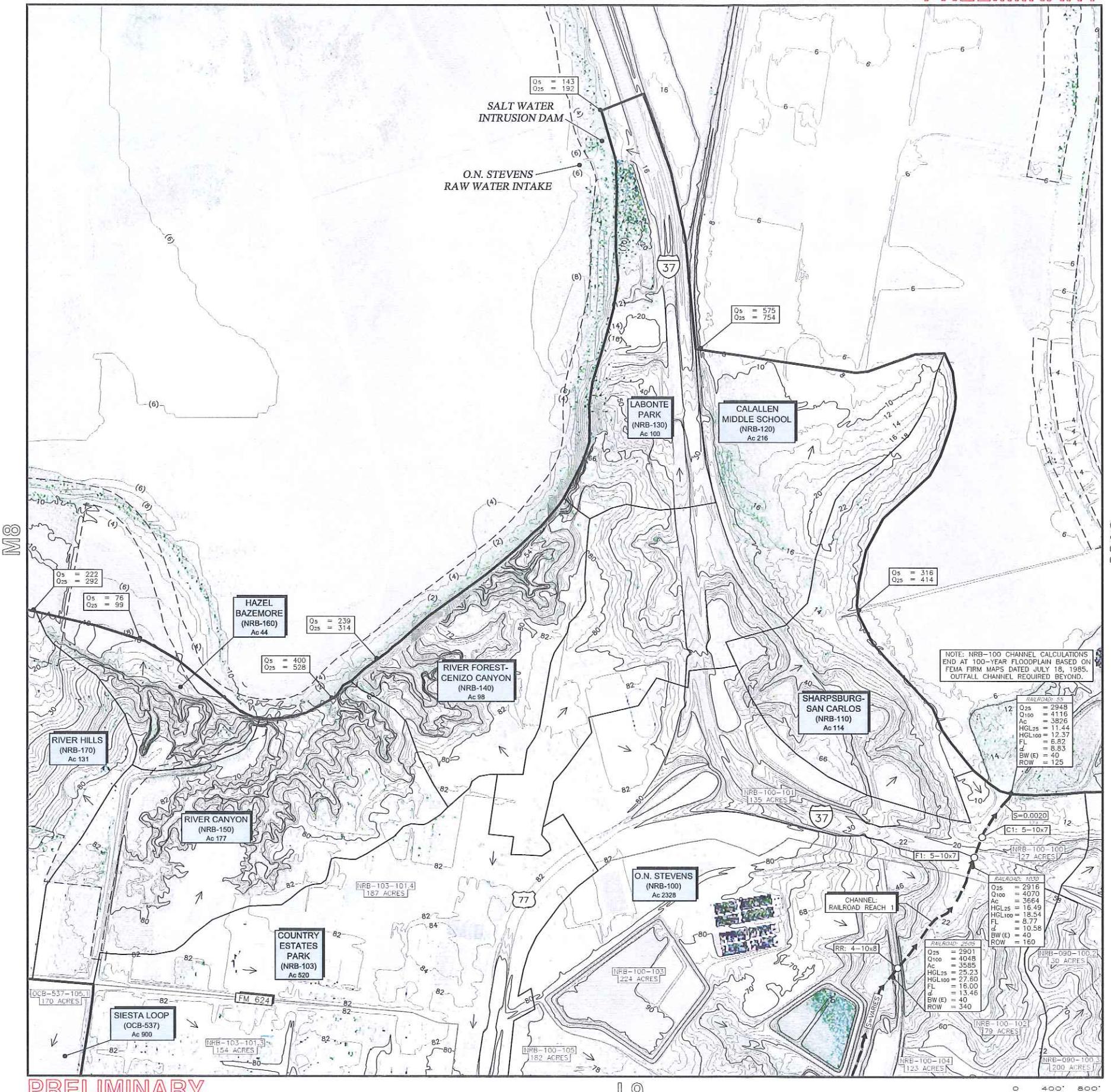
END OF MAP

PRELIMINARY



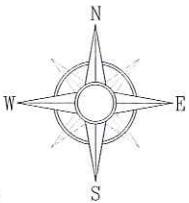
END OF MAP

PRELIMINARY



STORM WATER MAP

SUB-BASINS THAT SHOW UPDATED INFORMATION



LEGEND:

	BASIN BOUNDARY LINE
	SUB-BASIN BOUNDARY LINE
	SUB-AREA BOUNDARY LINE
	CORPUS CHRISTI CITY LIMITS
<u>-----</u> 32 <u>(34)</u>	2-FOOT LIDAR CONTOURS (BOLDED EVERY 10-FOOT)
<u>-----</u> SUB-BASIN (NUMBER)	2-FOOT USGS CONTOURS (BOLDED EVERY 10-FOOT)
<u>Ac</u>	TOTAL ACRES OF SUB-BASIN
<u>SUB-AREA-NUMBER</u>	SUB-AREA NUMBER (SUB-AREA SIZE SHOWN IN ACRES)
<u>→</u>	RUNOFF
<u>----- →</u>	CHANNEL ALIGNMENT
<u>----- ►</u>	CLOSED SYSTEM
CHANNEL: NAME	NAME OF CHANNEL
UNDERGROUND: NAME	NAME OF UNDERGROUND INFRASTRUCTURE
S=0.001	CHANNEL SLOPE (FT/LF)
<u>SYSTEM: STATION</u>	DRAINAGE SYSTEM NAME AND MODEL STATION
Q25	PEAK FLOW RATE IN CFS (25yr EVENT)
Q100	PEAK FLOW RATE IN CFS (100yr EVENT)
CFS	CUBIC FEET PER SECOND
Ac	CUMULATIVE ACRES AT GIVEN LOCATION
HGL25	HYDRAULIC GRADE LINE (25yr EVENT)
HQL100	HYDRAULIC GRADE LINE (100yr EVENT)
FL	FLOW LINE ELEVATION
d	CHANNEL DEPTH
BW(F)	BOTTOM WIDTH (EARTHEN CHANNEL)
BW(C)	BOTTOM WIDTH (CONCRETE CHANNEL)
SIZE	SIZE OF CLOSED SYSTEM
ROW	DRAINAGE RIGHT-OF-WAY
O	FUTURE CROSSING STRUCTURE (TYPE & SIZE SHOWN)
SF	SQUARE FEET
FO	EFFECTIVE OPENING

SEAL AREA:

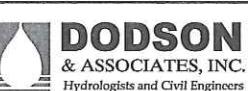
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OF WILLIAM J. GREEN
P.E. # 65721
ON YEAR 2009
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SEAL AREA:

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OF SARAH L. WEST
P.E. # 101328
ON YEAR 2009
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GOLDSTON ENGINEERING
A CH2M HILL COMPANY



The logo for the City of Corpus Christi features a stylized city skyline with palm trees and a wavy base.



CITY OF CORPUS CHRISTI
STORM WATER DEPARTMENT
CITY PROJECT NO. 2083

MAP NO. M9

REV_DATE: 03-26-2009

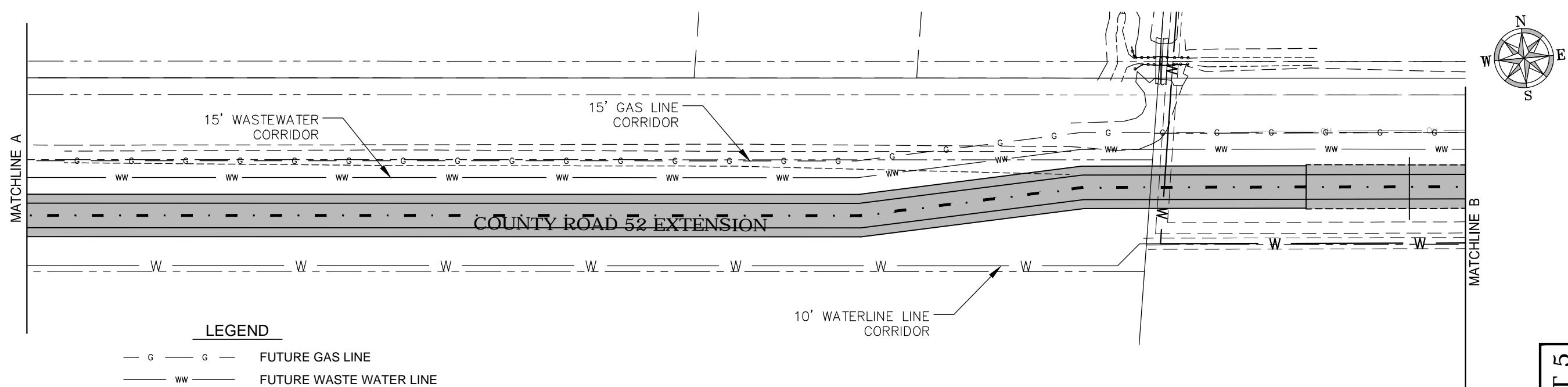
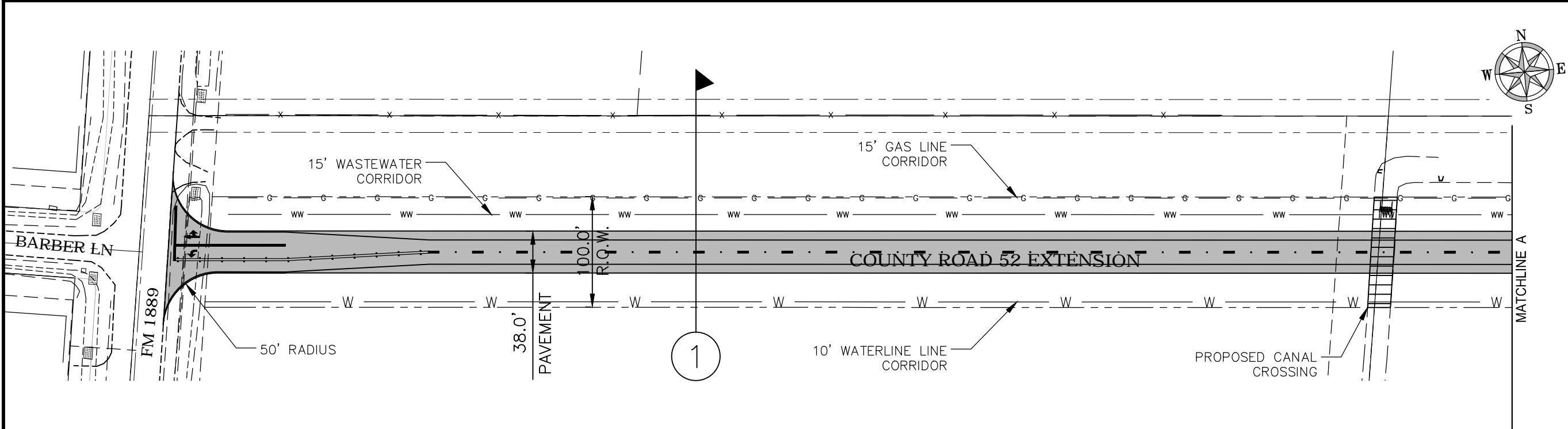
APPENDIX E

Proposed Street & Utility Improvements

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101905 ON 06/07/13, AND
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CONSTRUCTION, BIDDING,
OR PERMIT PURPOSES.

Naismith
Engineering Inc.
TBPE Firm Registration No. F-000355

Corpus Christi
Engineering
Corpus Christi
Engineering



- LEGEND
- G — G — FUTURE GAS LINE
 - WW — FUTURE WASTE WATER LINE
 - W — EXISTING WATER LINE
 - OH — OH — EXISTING OVER HEAD POWER LINE
 - X — EXISTING FENCE



EXHIBIT 5

SHEET 5 of 8
RECORD DRAWING NO.
STR —
CITY PROJECT # E12136

COUNTY ROAD 52 EXTENSION
FROM CR69 TO FM 1889
(BOND ISSUE 2012)

RECOMMENDED STREET LAYOUT

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TBPE Firm Registration No. F-000355

COUNTY ROAD 52 EXTENSION
FROM CR69 TO FM 1889
(BOND ISSUE 2012)

RECOMMENDED STREET LAYOUT

SHEET 6 of 8
RECORD DRAWING NO.

STR -

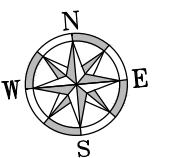
CITY PROJECT # E12136

EXHIBIT 6

REVISION NO.	DATE	BY	DESCRIPTION

REVISION NO.	DATE	BY	DESCRIPTION

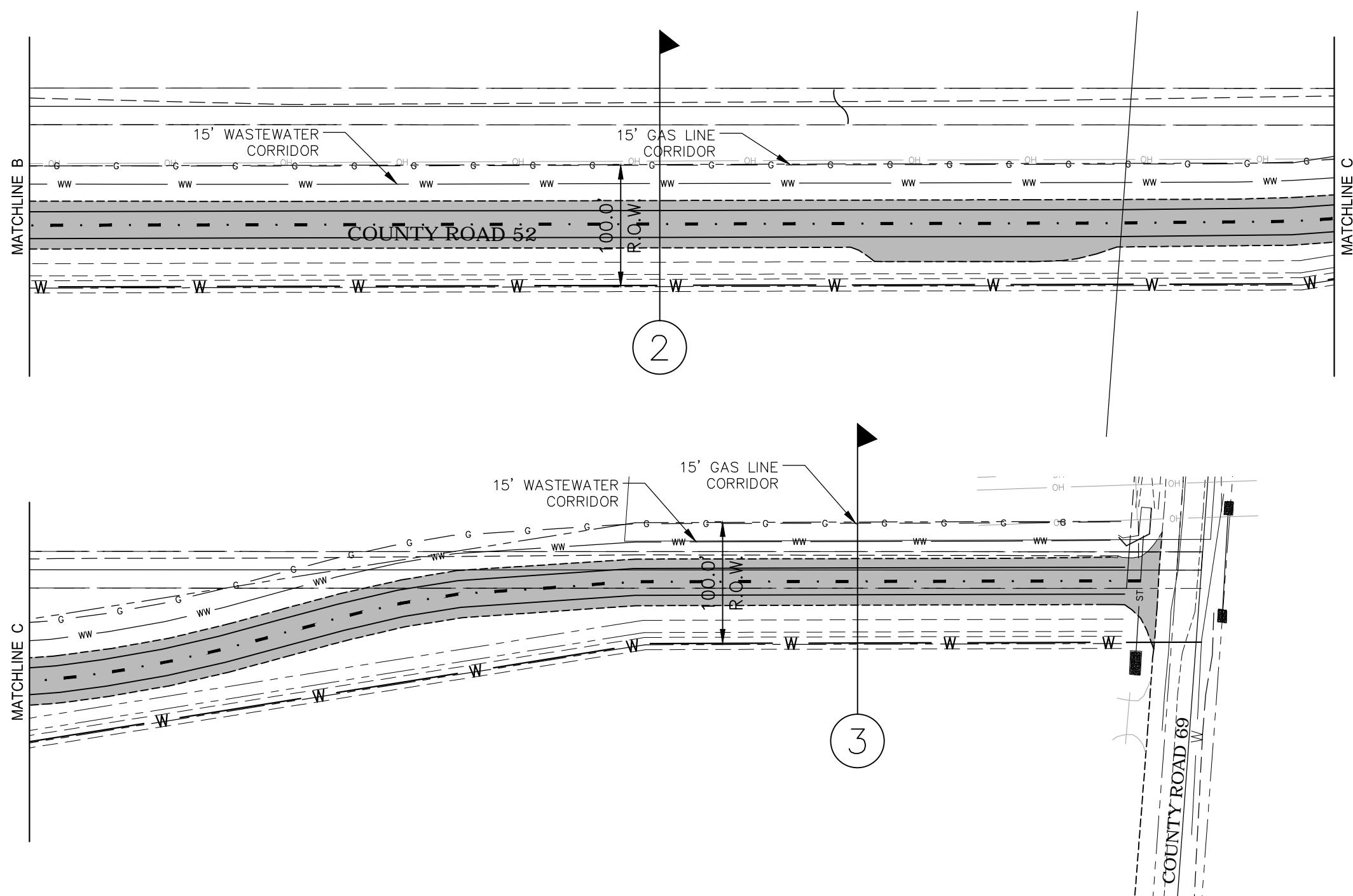
REVISION NO.	DATE	BY	DESCRIPTION



LEGEND

- G — G — FUTURE GAS LINE
- WW — FUTURE WASTE WATER LINE
- W — EXISTING WATER LINE
- OH — OH — EXISTING OVER HEAD POWER LINE
- X — EXISTING FENCE

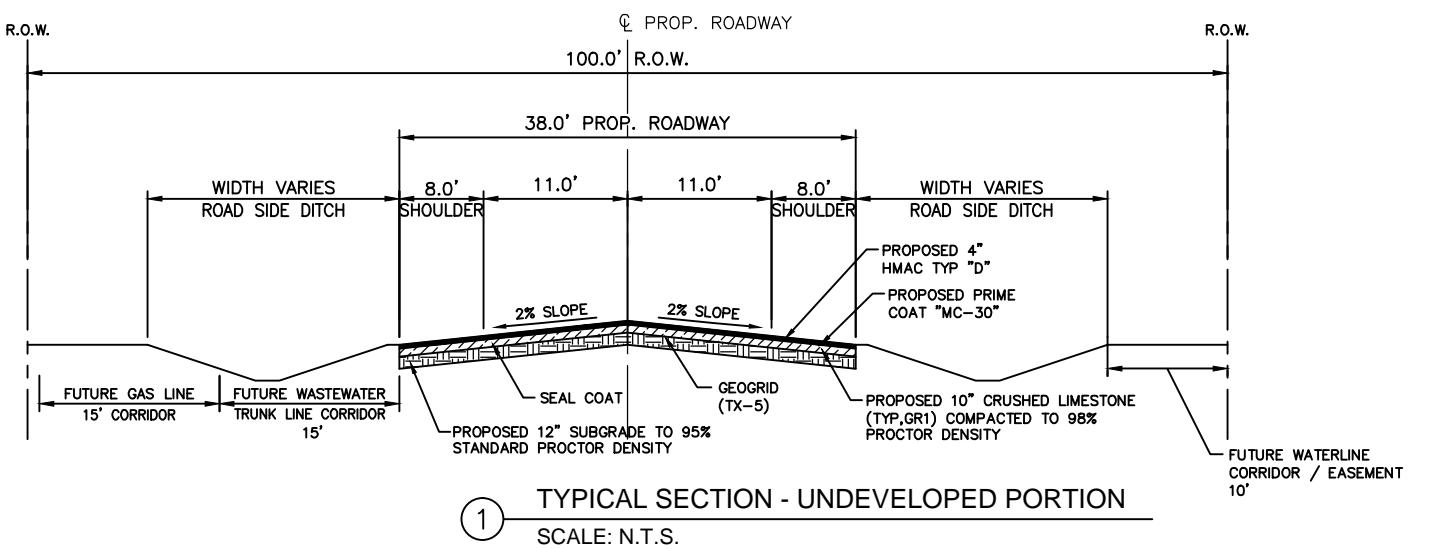
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GRAPHIC SCALE IN FEET



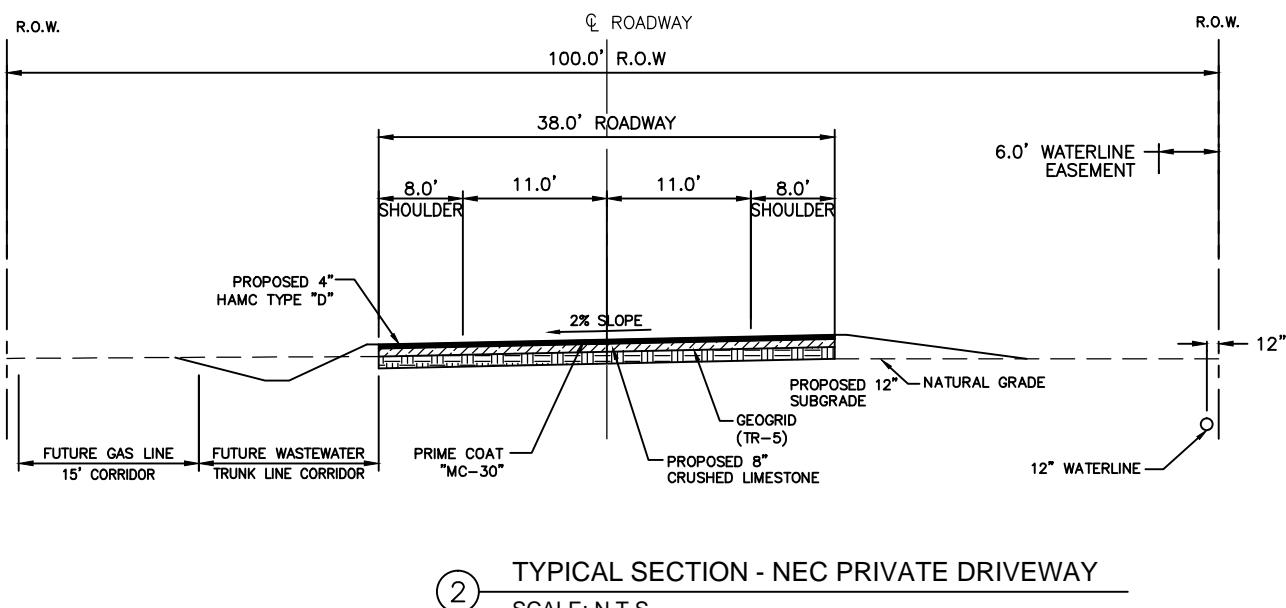
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OR PERMIT PURPOSES.



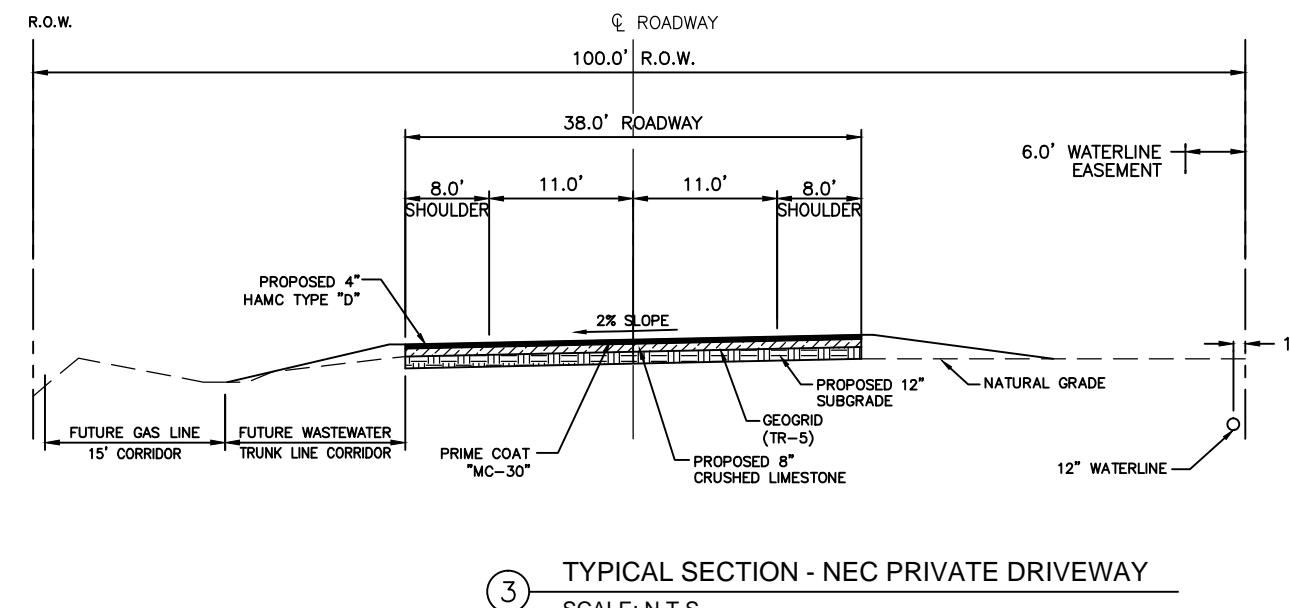
TBPE Firm Registration No. F-000355



① TYPICAL SECTION - UNDEVELOPED PORTION
SCALE: N.T.S.



② TYPICAL SECTION - NEC PRIVATE DRIVEWAY
SCALE: N.T.S.



③ TYPICAL SECTION - NEC PRIVATE DRIVEWAY
SCALE: N.T.S.

EXISTING AND PROPOSED CROSS SECTIONS

COUNTY ROAD 52 EXTENSION
FROM CR69 TO FM 1889
(BOND ISSUE 2012)

EXHIBIT 7

SHEET 7 of 8
RECORD DRAWING NO.
STR -
CITY PROJECT # E12136

APPENDIX F
Opinion of Probable Cost

ESTIMATE OF PROBABLE CONSTRUCTION COSTS

COUNTY ROAD 52 EXTENSION - FROM CR 69 TO US 77 (CITY PROJECT NO. E12136) SUMMARY TABLE

	Project Budget	Project Estimate
PART A - STREET IMPROVEMENTS		\$ 1,189,484.00
PART B - STORMWATER IMPROVEMENTS		\$ 487,580.00
PART C - WATER SYSTEM IMPROVEMENTS		\$ 100,000.00
PART D - NUECES ELECTRIC COOPERATIVE	\$ 2,850,000.00	\$ 982,459.75
PART E - R.O.W. & LAND ACQUISITION		\$ 30,000.00
CONTINGENCIES (10%)		\$ 27,895.24
TOTAL ESTIMATED CONSTRUCTION	\$ 2,850,000.00	\$ 2,817,420.00

ESTIMATE OF PROBABLE CONSTRUCTION COSTS

COUNTY ROAD 52 EXTENSION - FROM COUNTY ROAD 69 TO US 77 (CITY PROJECT NO. E12136)
FLEXIBLE (HMAC) PAVEMENT SECTION - (UNDEVELOPED SECTION)

ITEM #	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL AMOUNT
PART A - STREET IMPROVEMENTS					
1	Final Surface (2" Type D HMAC)	SY	11,600	\$ 17.25	\$ 200,100.00
2	Initial Surface (2" Type D HMAC)	SY	11,600	\$ 13.75	\$ 159,500.00
3	Seal Coat (One Course)	SY	12,800	\$ 3.50	\$ 44,800.00
4	Prime Coat, MC-30 (0.15 Gal/SY)	GAL	1,950	\$ 5.25	\$ 10,237.50
5	10" Crushed Limestone Base Material	SY	12,800	\$ 20.25	\$ 259,200.00
6	Geogrid, Tensar TX5	SY	12,800	\$ 4.50	\$ 57,600.00
7	Subgrade Preparation (12" minimum)	SY	12,800	\$ 1.00	\$ 12,800.00
8	Excavation and Embankment	SY	12,800	\$ 6.00	\$ 76,800.00
9	Reflective Pavement Markers (Type 1)(White)(4")(Solid)	LF	5,300	\$ 1.00	\$ 5,300.00
10	Reflective Pavement Markers (Type 1)(Yellow)(4")(Broken)	LF	650	\$ 1.00	\$ 650.00
11	Reflective Pavement Markers (Type 1)(Yellow)(4")(Double)(Solid)	LF	230	\$ 1.00	\$ 230.00
12	Reflective Pavement Markers (Type 1)(White)(24")(Solid)(Stop Bar)	LF	40	\$ 8.00	\$ 320.00
13	Reflective Pavement Markers (Type 1)(White)(Arrow or Word)	EA	6	\$ 200.00	\$ 1,200.00
14	Raised Pavement Markers (Type I-C)	EA	5	\$ 7.00	\$ 35.00
15	Raised Pavement Markers (Type II-A-A)	EA	57	\$ 7.00	\$ 399.00
16	Seeding	SY	16,200	\$ 6.00	\$ 97,200.00
17	Stormwater Pollution Prevention Plan	LS	1	\$ 25,000.00	\$ 25,000.00
18	Traffic Control Plan	LS	1	\$ 25,000.00	\$ 25,000.00
19	Ozone Action Day	EA	4	\$ 2,500.00	\$ 10,000.00
20	Exploratory Excavations	LS	1	\$ 10,000.00	\$ 10,000.00
21	Asphalt Demolition	SY	1,050	\$ 0.75	\$ 787.50
22	Pavement Repair	SY	25	\$ 125.00	\$ 3,125.00
23	Regulatory Signage	EA	7	\$ 600.00	\$ 4,200.00
24	Mobilization	LS	1	\$ 125,000.00	\$ 125,000.00
25	Demobilization	LS	1	\$ 60,000.00	\$ 60,000.00
				PART A - SUBTOTAL	\$ 1,189,484.00
PART B - STORMWATER IMPROVEMENTS					
26	24" Reinforced Concrete Pipe (Class III)	LF	800	\$ 120.00	\$ 96,000.00
27	Trench Safety for Stormwater	LF	800	\$ 3.00	\$ 2,400.00
28	Sloped End Treatment	EA	12	\$ 2,000.00	\$ 24,000.00
29	Swale Excavation	CY	8,860	\$ 13.00	\$ 115,180.00
30	Dewatering of Trench	LF	800	\$ 250.00	\$ 200,000.00
31	Allowance for Unanticipated Utility Adjustments	LS	1	\$ 50,000.00	\$ 50,000.00
				PART B - SUBTOTAL	\$ 487,580.00
PART C - WATER SYSTEM IMPROVEMENTS					
32	Irrigation Canal Crossing	LS	1	\$ 100,000.00	\$ 100,000.00
				PART C - SUBTOTAL	\$ 100,000.00
Sub-Total					
					\$ 1,777,064.00
Contingencies (10%)					
					\$ 177,706.40
TOTAL ESTIMATED CONSTRUCTION (UNDEVELOPED SECTION)					
					\$ 1,954,770.40

ESTIMATE OF PROBABLE CONSTRUCTION COSTS

COUNTY ROAD 52 EXTENSION - FROM COUNTY ROAD 69 TO US 77 (CITY PROJECT NO. E12136)
FLEXIBLE (HMAC) PAVEMENT SECTION - (NUECES ELECTRIC COOPERATIVE PRIVATE DRIVE)

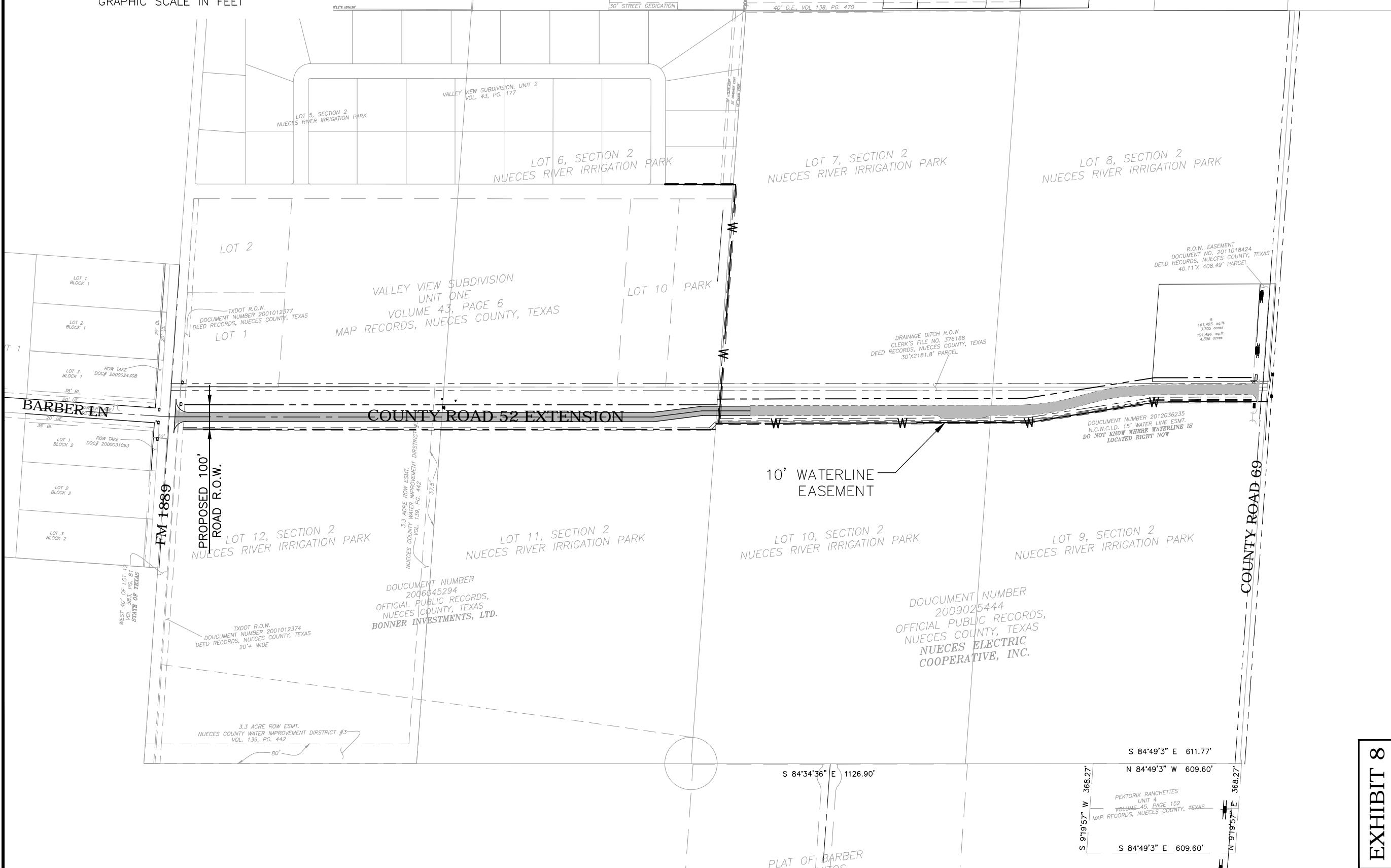
ITEM #	DESCRIPTION	UNIT	QUANTITY	UNIT PRICE	TOTAL AMOUNT
PART D - STREET IMPROVEMENTS					
1	Final Surface (2" Type D HMAC)	SY	9,600	\$ 17.25	\$ 165,600.00
2	Initial Surface (2" Type D HMAC)	SY	9,600	\$ 13.75	\$ 132,000.00
3	Seal Coat (One Course)	SY	10,100	\$ 3.50	\$ 35,350.00
4	Prime Coat, MC-30 (0.15 Gal/SY)	GAL	1,515	\$ 5.25	\$ 7,953.75
5	8" Crushed Limestone Base Material	SY	10,100	\$ 20.25	\$ 204,525.00
6	Geogrid, Tensar TX5	SY	10,100	\$ 4.50	\$ 45,450.00
7	Subgrade Preparation (12" minimum)	SY	10,100	\$ 1.00	\$ 10,100.00
8	Excavation and Embankment	SY	10,100	\$ 6.00	\$ 60,600.00
9	Reflective Pavement Markers (Type 1)(White)(4")(Solid)	LF	5,306	\$ 1.00	\$ 5,306.00
10	Reflective Pavement Markers (Type 1)(Yellow)(4")(Broken)	LF	460	\$ 1.00	\$ 460.00
11	Reflective Pavement Markers (Type 1)(Yellow)(4")(Double)(Solid)	LF	5,306	\$ 1.00	\$ 5,306.00
12	Reflective Pavement Markers (Type 1)(White)(24")(Solid)(Stop Bar)	LF	41	\$ 8.00	\$ 328.00
13	Reflective Pavement Markers (Type 1)(White)(Arrow or Word)	EA	2	\$ 200.00	\$ 400.00
14	Raised Pavement Markers (Type I-C)	EA	47	\$ 7.00	\$ 329.00
15	Raised Pavement Markers (Type II-A-A)	EA	6	\$ 7.00	\$ 42.00
16	Seeding	SY	4,500	\$ 6.00	\$ 27,000.00
17	Stormwater Pollution Prevention Plan	LS	1	\$ 10,000.00	\$ 10,000.00
18	Traffic Control Plan	LS	1	\$ 25,000.00	\$ 25,000.00
19	Ozone Action Day	EA	4	\$ 2,500.00	\$ 10,000.00
20	Exploratory Excavations	LS	1	\$ 10,000.00	\$ 10,000.00
21	Asphalt Demolition	SY	1,050	\$ 0.75	\$ 787.50
22	Pavement Repair	SY	25	\$ 125.00	\$ 3,125.00
23	Regulatory Signage	EA	7	\$ 600.00	\$ 4,200.00
24	Mobilization	LS	1	\$ 100,000.00	\$ 100,000.00
25	Demobilization	LS	1	\$ 50,000.00	\$ 50,000.00
				PART A - SUBTOTAL	\$ 913,862.25
PART D - STORMWATER IMPROVEMENTS					
26	8 Ft x 2 Ft Concrete Box Culvert	LF	90	\$ 400.00	\$ 36,000.00
27	Trench Safety for Stormwater	LF	90	\$ 2.50	\$ 225.00
28	Swale Excavation	CY	1,400	\$ 13.00	\$ 18,200.00
29	Concrete Rip Rap (Apron)	SF	23	\$ 7.50	\$ 172.50
30	Reinforced Concrete Pilot Channel	LF	40	\$ 100.00	\$ 4,000.00
31	Allowance for Relocation of Utilities	LS	1	\$ 10,000.00	\$ 10,000.00
				PART B - SUBTOTAL	\$ 68,597.50
Sub-Total					
Contingencies (10%)					
TOTAL ESTIMATED CONSTRUCTION (NEC PRIVATE DRIVE)					
\$ 1,080,705.73					

APPENDIX G

Right-Of-Way & Acquisition



400 200 0 400 800
GRAPHIC SCALE IN FEET



CONSULTANT'S SHEET
PROJECT NO. 9015

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Naismith
Engineering Inc

TBPE Firm Registration No. F-000355



Corpus Christi
Engineering

COUNTY ROAD 52 EXTENSION
FROM CR69 TO FM 1889
(BOND ISSUE 2012)

RIGHT-OF-WAY & ACQUISITION

SHEET 8 of 8
RECORD DRAWING NO.
STR -
CITY PROJECT # E12136